THE INFLUENCE OF INTEREST RATE AND GOVERNMENT DEVELOPMENT EXPENDITURE ON HOUSE PRICE AND IDENTIFICATION OF HOUSING BUBBLE IN MALAYSIA

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ABSTRACT

House prices in Malaysia have recorded higher levels every year. Many scholars argue that there might be housing bubble in Malaysia. This study investigates the housing prices in Malaysia. In particular, the objective of this study is to explore the effect of interest rates and government development expenditure on house price in Malaysia in the long run; to examine the effect of interest rates and government development expenditure on house price in Malaysia in the short run; and to identify the existence of bubble in Malaysian housing market. The methodologies used in this study are Vector Error Correction Model (VECM) and Price Stability Model (PSM) to investigate house price in Malaysian over the past 34 years from 1985 to 2018. The variables in empirical analysis used house price, interest rates, and government development expenditure are house price index, base lending rates, and government spending in developing the infrastructure and facilities. The findings show that development expenditure has a significant positive relationship with Malaysian house price. However, interest rates show a positive result due to some of the reasons such as houses are a necessity for the people and the influences of other variables are more significant in the housing market. The finding also shows that the short run Malaysian house price converges to its equilibrium in the long run. The result of PSM analysis shows that housing bubble have significantly existed in Malaysian housing market. The policies proposed to address the issue of house prices and housing bubbles include establishing suitable asset-liability management and liquidity management, adopting suitable measurement in credit screening process and monitoring housing market to prevent housing bubbles. The implication of these policies keep investment activities away from speculation as well as preventing low credit borrowers from getting high loans to avoid risks.

Keywords: house price, interest rates, development expenditure, housing bubble

ABSTRAK

Harga rumah di Malaysia telah mencapai tahap yang semakin tinggi setiap tahun. Ramai sarjana berhujah bahawa terdapat kemungkinan wujudnya gelembung perumahan di Malaysia. Kajian ini mengkaji harga rumah di Malaysia. Secara khusus, objektif kajian ini meneroka impak kadar bunga dan perbelanjaan pembangunan kerajaan ke atas harga rumah di Malaysia dalam jangka masa panjang; memeriksa impak kadar bunga dan perbelanjaan pembangunan kerajaan ke atas harga rumah di Malaysia dalam jangka masa pendek; dan mengenal pasti gelembung perumahan di Malaysia. Metodologi yang digunakan dalam kajian ini ialah Model Vektor Pembetulan Ralat *(VECM)* dan Model Kestabilan Harga *(PSM)* bagi mengkaji harga rumah Malaysia selama 34 tahun dari 1985 hingga 2018. Pembolehubah yang digunakan dalam analisis empirik untuk harga rumah, kadar bunga, dan perbelanjaan pembangunan kerajaan ialah indeks harga rumah, kadar pinjaman asas, dan perbelanjaan kerajaan dalam membangunkan infrastruktur dan fasiliti. Keputusan kajian menunjukkan perbelanjaan pembangunan mempunyai hubungan positif yang signifikan dengan harga rumah. Namun demikian, kadar bunga menunjukkan keputusan yang positif disebabkan oleh beberapa sebab seperti rumah amat diperlukan oleh rakyat dan kesan faktor-faktor lain yang lebih signifikan dalam pasaran perumahan. Keputusan juga menunjukkan harga rumah dalam jangka masa pendek memusat kepada keseimbangan jangka masa panjangnya. Keputusan analisis *PSM* menunjukkan gelembung perumahan telah wujud secara signifikan dalam pasaran perumahan. Polisi-polisi yang dicadangkan untuk mengatasi isu harga rumah dan gelembung perumahan termasuklah menubuhkan pengurusan aset-liabiliti dan kecairan yang sesuai, mengamalkan pengukuran yang sesuai dalam proses tapisan kredit dan memantau pasaran perumahan bagi mengelakkan gelembung perumahan. Implikasi polisi-polisi tersebut dapat memastikan aktiviti-aktiviti pelaburan bebas daripada spekulasi dan peminjam-peminjam kurang berkemampuan daripada pinjaman yang tinggi bagi mengelakkan risiko.

Kata kunci: harga rumah, kadar bunga, perbelanjaan pembangunan, gelembung perumahan

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Clement Chen Khang-qing

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LIST OF ABBREVIATIONS

AFC	-	Asian Financial Crisis
AIC	-	Akaike Information Criterion
ARDL	-	Auto Regressive Distributed Lags
ARM	-	Adjustable Rate Mortgage
BIS	-	Bank of International Settlement
BNM	-	Bank Negara Malaysia
BSN	-	Bank Simpanan Nasional
CCRIS	-	Central Credit Reference Information System
CTOS	-	Credit Tip-Off Service
DEX	-	Development Expenditure
ECT	-	Error Correction Term
GDP	-	Gross Domestic Product
GFC	-	Global Financial Crisis
GPG	-	Global Property Guide
HPI	-	House Price Index
HPM	-	Hedonic Price Method
HSG	-	Housing Scheme
IMF	-	International Monetary Fund
INT	-	Interest Rate
JB	-	Jarque-berra
JPPH	-	Valuation and Property Service Department
KLIA	-	Kuala Lumpur International Airport
LRT	-	Light Rapid Transit
MFHS	-	My First Home Scheme

MRT - Mass Rapid Transit

NAPIC - National Property Information Center

OECD - Organization for Economic Cooperation

OFHEO - Office of Federal Housing Oversight

PPR - People's Housing Project

PR1MA - 1 Malaysia People's Housing Programme

PSM - Price Stability Model

RAMCI - RAM Credit Information Sdn Bhd

RPGT - Real Property Gain Tax

SIC - Schwarz Information Criterion

SPP - Skim Pinjaman Perumahan

SRP - My First Home Scheme

UK - United Kingdom

US - United States

VAR - Vector Autoregression

VECM - Vector Error Correction Model

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

House price represents as one of the most important indicators for economists and policy makers to evaluate housing market condition. Its importance is reflected by playing certain key roles such as investment component and goal of monetary policy in a financial system. Besides, house price always reflects a large picture in a country which portrays several economic components such as banking system, construction sector, prosperity of a nation, and others. There are a lot of economic consideration for policy makers and bankers to make decision when it comes to housing market. For instance, the government implements its policies to control the house price, housing loan, and housing affordability. The methods of making policies are not only affecting the housing sector, but also related to the country's development up to the extent of reducing poverty, monitoring inflationary pressure, and the interrelation between banking sectors as well as exchange rate.

House price can be defined as the cost of owning a house. Similar to other goods and services, house price can be very fluctuated based on many factors such as demand and supply for houses. House price is a necessary cost in daily life, it could influence the household wealth easily. This is especially significant during the time when house price is being too high until it is beyond the affordability. House price has to be staying at a balance extend where it is not too high nor too low. This is because higher house price will cause people getting harder to own a house, while lower house price will end up capital losses for investors and homebuyers (Hoynes & McFadden, 1994).

Similar to a stable politic environment in a country, a stabilized house price and housing sector are also very important to strengthen most of the economic activity in a

country. This is due to the fact that a stable house price and expansionary monetary policy provide a more investable housing environment for homeowners and investors to make collateral against their borrowing. With higher purchasing power or demand for houses, economic activities will be improved and *vice versa.* Therefore, it is crucial to monitor house price in order to create a healthy economic environment. Hence, high house price which does not being monitored by proper government policies could cause inaccurate economic decisions in the system and lead to financial crisis at the end.

1.1.1 House Price

House price refers to the value of properties which have been newly launched or existing real estate (OECD Economic Outlook, 2019). In Malaysian housing market, house price shows an unprecedented hike since 1990s. Generally, trend of house price is affected by many factors (Pillaiyan, 2015). Many scholars believe that hiking of house price is attributed to fundamental changes such as country's gross domestic product (GDP), inflation rate, and interest rate (Lu *et al.,* 2015; Pillaiyan, 2015; Yip *et al.,* 2016; Zainuddin, 2010). Malaysian housing sector becomes more and more relevant in the economy development since 1990s. The sector arose since there was a significant migration of citizen between rural and urban areas that boosted housing development in many areas especially in main cities such as Kuala Lumpur, Pulau Pinang, and Johor Bahru. This was believed to contribute a gradual rising of house price in Malaysia since 1990s.

House price in a country is always viewed in the form of index, which commonly known as house price index (HPI). HPI is an index that presents the changes of house price in residential houses. HPI is calculated by using hedonic regression or simple moving average (Downie *et al.,* 2009). Generally, hedonic regression becomes significant in measuring HPI because it breaks down the data into its constituent

characteristics and acquires estimation of contributory value of each characteristic (Baltas & Freeman, 2001). On the other hand, simple moving average measures data by deriving from its averages of different subsets of the full data set, this is also important as HPI consists of many regional house price to form an average one (Savitzky & Golay, 1964). HPI has become a general measurement of house price in many countries such as the United States (US), the United Kingdom (UK), Ireland, India, and Canada. It is important in measuring house price because of its calculation that takes instruments such as regional and national house price data into account (Lum, 2004). The Valuation and Property Service Department (JPPH) of Malaysia measures HPI by using 70 sets of sub-indices that cover national house price indices, state house price indices, and house type sub-indices such as terraced, semi-detached, detached, and high-rise unit (Zainuddin, 2010). Overall, Malaysian HPI is generated by using Laspyeres index, which is also derived from hedonic model regression (see Appendix A).

Figure 1.1 shows the trend of HPI in Malaysia from 1986 to 2015. In general, it increases gradually. In particular, Malaysian HPI increased gradually since 1980s. The figure obviously shows that house price in Malaysia climbed from year 1985 until 2018. Throughout the years, there were several points that experienced a relatively significant increase of Malaysia HPI. According to JPPH (2017), there were a simultaneous increase of annual house price at 25.5 percent and 12.2 percent in 1991 and 1992, respectively. The house price in Malaysia continued to grow in mid-1990s especially during the period right before Asian Financial Crisis (AFC).

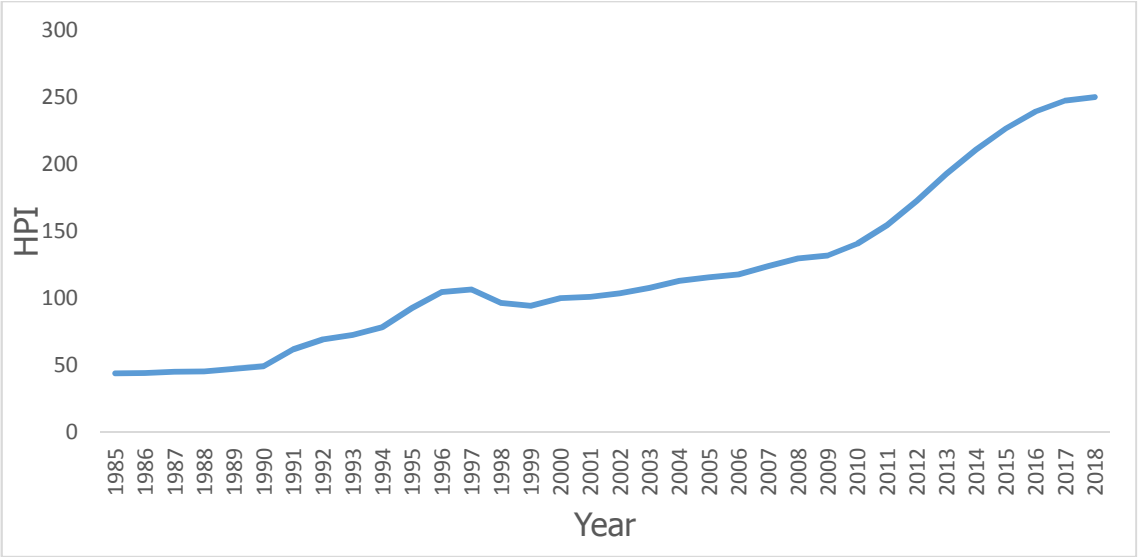

Figure 1.1
Trend of Malaysian House Price Index, 1986-2015

Source: National Property Information Centre, 2017

Later on, the impact of AFC in 1997 and 1998 caused the HPI to record a little slump after reaching its peak in 1997. According to Global Property Guide (GPG) (2007), house price in main cities such as Kuala Lumpur had confronted a drop by 39 percent from year 1997 to 1999. At the same time, there was a plunge of 9.4 percent in Malaysian HPI just at the end of year 1998.

Fortunately, the Global Financial Crisis (GFC) in 2008 did not make a significant strike in Malaysian housing market. Afterward, with the launching of housing scheme of Malaysian government such as 1 Malaysia People's Housing Programme (PR1MA), My First Home Scheme (SRP), and People's Housing Project (PPR), the housing market received another climb beginning from 2010. Such effects were related to the launching of PR1MA in July 2011 and continuous developments in rural and urban areas by five years Malaysia Plans. Additionally, government development in the city such as "The Mass Rapid Transit (MRT) Project" and Greater Kuala Lumpur Plan added additional value to the property in cities as well.

Specifically during 2001 to 2004, there was an annual increase of house price in Malaysia by 7.3 percent averagely or 29.2 percent for a total of increment of Malaysian house price over the four years. After that, during 2005 to 2008, an annual increase of 6.1 percent of house price in Malaysia was recorded averagely or a total of 24.2 percent of accumulated increment of house price in Malaysia over the four years. Finally, during 2009 to 2012, an annual growth of Malaysian house price was 9.4 percent averagely or 37.6 percent as a total growth over the four years (Yip *et al.,* 2016).

Table 1.1 presents the annual house price change in Malaysian states in the third quarter of 2016. In the table, Kedah, Selangor, Negeri Sembilan, Johor, Melaka, and Kuala Lumpur had the highest annual price increase among the states. On the other hand, Pahang, Sarawak, Pulau Pinang, Terengganu, and Perak also recorded an increased changes of annual house price, but in a relatively moderate pace. Perlis and Sabah did not make any significant changes over 2016 while Kelantan was the only state that experienced a slight fall of the annual house price in 2016.

Table 1.1
Annual House Price Change of Malaysian States in Third Quarter 2016

States in Malaysia	**Annual House Price Change (%)**
Kedah	8.8
Selangor	7.5
Negeri Sembilan	6.8
Johor	5.5
Melaka	5.5
Kuala Lumpur	5.1
Pahang	4.2
Sarawak	3.6
Pulau Pinang	3.4
Terengganu	3.0
Perak	2.5
Perlis	0
Sabah	0
Kelantan	-0.4

Source: Valuation & Property Services Department, 2017

Overall, Figure 1.2 shows the trend of HPI in main states such as Kuala Lumpur, Pulau Pinang, Perak, Selangor, Negeri Sembilan, and Johor in Malaysia. Since 1999, all the main cities had recorded a lower HPI at around 70. The indices continued to rise gradually until 2015 to achieve higher and higher values.

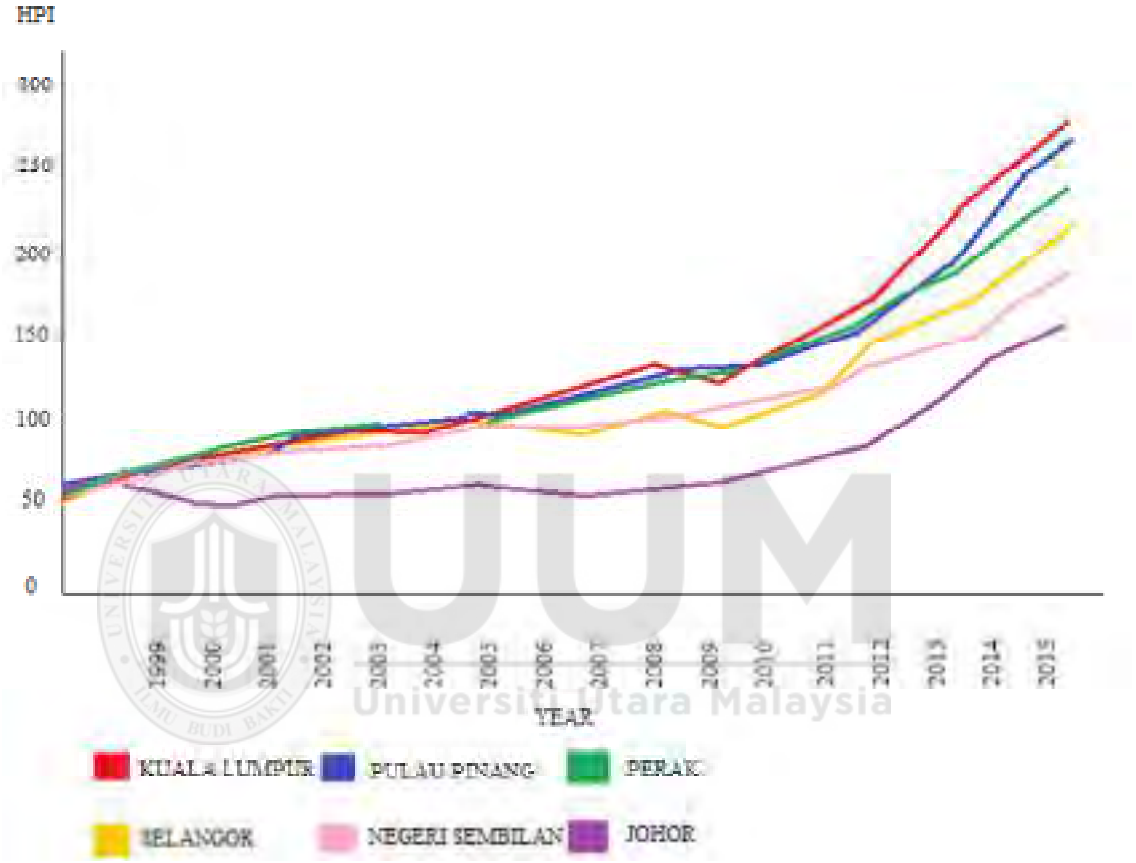

Figure 1.2
HPI in Malaysian Main Cities, 1999-2015

Source: Global Property Guide Report, 2017

Interestingly, there are four property types in Malaysian housing market, which include terraced house, high-rise residential properties, detached house, and semi-detached house. As shown in Table 1.2, detached house has the highest average prices at RM560,987, while terrace house has the lowest price among the property types,

which were RM299,012. This is related with the square feet occupied for those property type (GPG, 2017).

Table 1.2
Average Prices of Property Type in Malaysia in 2016

Property Type	Average Prices (RM)
Terraced House	299, 012
High-rise Residential Properties	320, 782
Detached House	560, 987
Semi-detached House	500, 943

Source: Global Property Guide, 2017

The trend of house price in Malaysia has worried many scholars and policy makers as it portrays an important sign of protracted booming market especially after 1990s. According to Yip *et al.* (2016), the phenomenon of hiking in Malaysian house price in recent 15 years in 2000s might have housing bubble that collapses or bursts the national economy. The effect of bursting housing bubble process a tremendous risk to many aspects such as massive economic and social damage, disadvantages for banking system, household consumption and others (Yip *et al.,* 2016). The reason of house price being concerned by a lot of scholars and policy makers is because of its rapid rise would indicate housing bubble that may potentially push the economy into recession.

1.1.3 Interest Rate

Interest rate is the percentage of financial institution or banks charge to the borrowers due to the loan being lent out. Typically, the interest rate is charged on the outstanding loan with given annual percentage. The interest rate is one of the important economic variables which influences in both macro and micro economy activities. According to Li (2015), interest rate represents the main method to forecast the macroscopic economic situation.

The Malaysian interest rate is ranged between six percent and 10 percent from 1989 to 2014. Figure 1.3 shows the trend of base lending rate, which is one of the interest rate in Malaysia. From 1989 to 2000, the trend of Malaysian interest rate was fluctuated. It climbed from seven percent to 10 percent within five years from 1989 to 1993. However, the interest rate dropped to six percent again in 1995 and increased gradually to 11 percent in 1998. Finally, the Malaysian interest rate dropped to six percent in 2000. For the following years, the interest rate experienced small changes from 2000 onwards with minor fluctuation around six percent.

According to Bank Negara Malaysia (BNM) (2018), the consistent trend of relative low interest rate in 2000s is to support the economic growth and lower inflation. The degree of interest rate accommodativeness in Malaysia is consistent for ensuring sustainability in Malaysian economic activities and yielding a stable growth path from 2000 to 2014. With Malaysian fundamental economic strength, steady economic growth, and low unemployment rate, BNM (2018) stated that the consistent interest rate in recent years did assist in controlling inflationary pressures and providing appropriate monetary supply to the country.

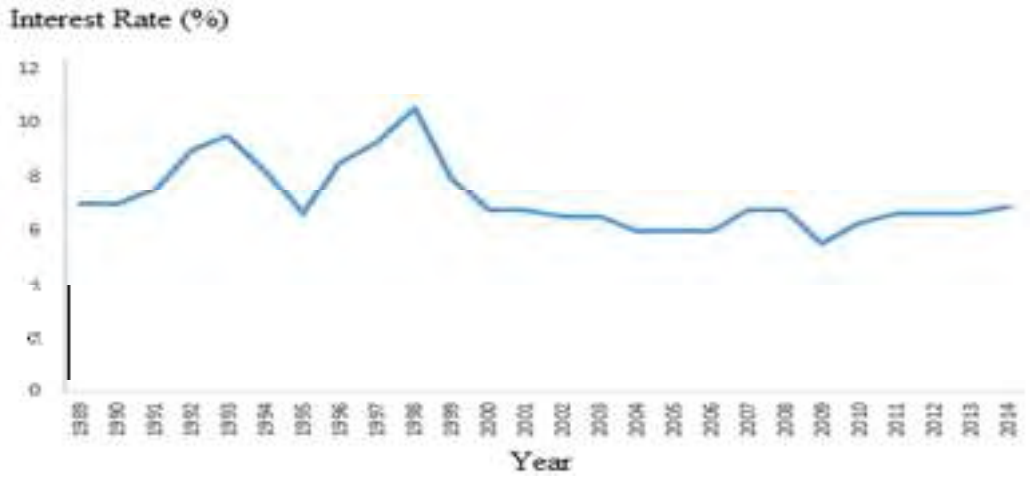

Figure 1.3
Interest Rate, 1989-2014

Source: Department of Statistics Malaysia, 2015

In housing market, the changes of interest rate could affect house price in long run. According to Unterman (2006), low interest rate contributes to the most reason that boomed the house price. One of the significant instances can be presented is the US housing market. According to Crouhy *et al*. (2008), the US had higher demand for houses during the period when their one-year adjustable rate mortgage (ARM) reduced from seven percent to four percent. Under the encouragement of the ARM, housing market was started to boom in 2000s. This is due to the fact that interest rate represents as the cost of home buying and decision making in housing investment.

In addition, taking a housing loan to buy house will relate to interest rate offered by the banks. In Malaysia, the interest rate is determined by Bank Negara Malaysia (BNM) during Monetary Policy Meeting and it is adjusted by banks, respectively. This causes the interest rate to directly affect the cost of borrowing for housing loan from banks. Typically, a lower interest rate on mortgage loan will reduce the cost of buying a house and this will eventually drive up the housing demand for self-owning or investment in the housing market.

1.1.4 Government Development Expenditure

There are two types of government spending in Malaysia, which are government operating and development expenditure. Specifically, government development expenditure represents as the fund provided by Malaysian government in order to enhance the development in the fields of defence and security, economic services, social services, and general administration. According to Bryant and Eves (2014), government development expenditure can also be defined as the cost of a government used in providing infrastructure and facilities such as local roads, stormwater, electricity,

community facilities, and parks in order to improve, develop, and benefit residents in a region.

The government development expenditure can encourage the investment activity as implemented by infrastructure projects and capacity expansion in a country. A well-developed infrastructure and facility can enhance and attract more positive momentum in a country growth. In Malaysia, government development expenditure has been contributed to multiple fields such as public transportation, roads and bridges, as well as communities facilities like playground, school, and hospital. Besides, the connectivity between cities can be improved due to the launching of public transportation such as Light Rapid Transit (LRT) and monorails.

The trend of Malaysian government development expenditure is presented in Figure 1.4. Overall, the figure shows that Malaysian government development expenditure increases from 1985 to 2018. From 1985 to 1999, Malaysian government expenditure was increasing gradually to RM20 billion. In early 2000s, the government development expenditure climbed steeply until it reached around RM40 billion. Then, after a slight drop to RM25 billion in 2005, Malaysian government continued to increase its development expenditure to RM50 billion in 2009. Finally, the development expenditure continued to keep at the level around RM50 billion from 2009 to 2018.

The government development expenditure on infrastructure, public transportation, and facilities in a region can boost up the house price. This is due to the fact that people prefer housing areas with better infrastructure and facilities. The preference will create higher demand and lead to higher house price.

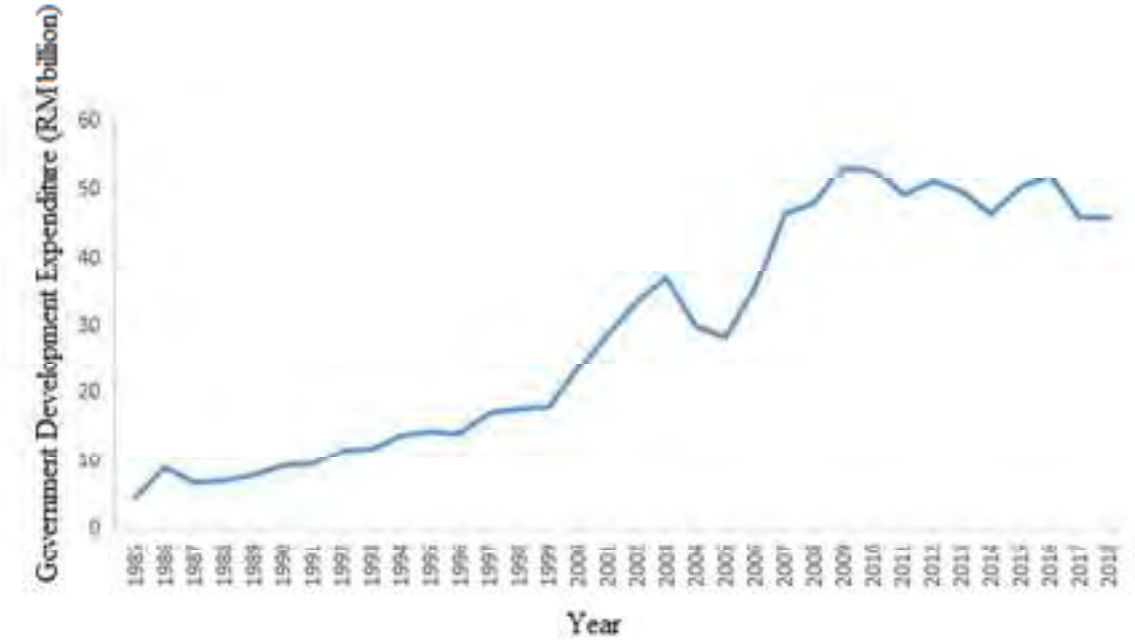

Figure 1.4
Government Development Expenditure, 1985-2018

Source: Department of Statistics Malaysia, 2018

Specifically, the government expenditure in the public transportation, such as in Selangor areas, has improved the living standard for people living or staying around. The completed projects includes Klang Valley Integrated Transit System that covers light rapid transit (LRT) lines, two commuter rail lines, one monorail line, one bus rapid transit line, one mass rapid transit line and an airport rail link to Kuala Lumpur International Airport (KLIA2) have benefited many city centres and suburbs such as Petaling Jaya, Subang Jaya, Gombak, Puchong, and Bukit Jalil. Due to the development expenditure being provided in the state, GPG Report (2017) showed that Selangor and Kuala Lumpur experienced the highest housing demand in Malaysia and finally lead to higher house price.

Meanwhile, Kuala Lumpur Integrated Transit Network is one of the significant development expenditure that can encourage greater regional development and increase the average annual commuters. Based on Table 1.3, there is an increasing trend of average annual commuters from 2001 to 2005 for all the categories for integrated transit

network. This indicates that government development expenditure, particularly for public transportation can attract and benefit more people to stay in the cities and utilize development provided by the government. The cities with higher connectivity and convenience will also have higher housing demand. This can eventually drive to higher house price through higher housing demand and value added in the cities. For example, regions such as Petaling Jaya, Subang Jaya, Gombak, Puchong, and Bukit Jalil are having high house price.

Table 1.3
Kuala Lumpur Integrated Transit Network Average Annual Commuters, 2001-2005

Types	Years				
Rapid KL, Kelana Jaya Line	143,778	149,105	154,869	160,361	165,695
Rapid KL, Ampang/Sri Petaling Line	88,201	91,702	107,082	120,426	125,208
KTM Komuter	57,339	60,504	67,522	74,960	85,733
KL Monorail	-	-	23,872	33,837	44,442
Express Rail, KLIA Ekspress/Transit	-	4,983	7,323	9,990	12,075

Source: Economic Planning Unit, Prime Minister's Department, 2014

1.2 Problem Statement

House price in Malaysia is gradually increasing. The problem is increasing long-run trending of house price as discussed in the previous section causes anxiety to economists, policy makers, investors, and homebuyers. The increasing house price happened in Malaysia from 1980s to 2018. The house price hikes significantly in the Malaysian main cities. The continuous hiking of house price cannot refrain scholars from thinking whether some policies such as interest rate, government development expenditure and housing scheme had coincidently fostered a gradual increasing pace of house price annually. This phenomenon exhibits a platform for this research to investigate long-run reasons behind hiking of house price in Malaysia.

Rising of short-term house price represents as another problem in housing sector. It includes diverting the short-run house price and slower adjustment process of the house price to its long-run equilibrium after crisis. According to Liong (2007), the housing sector relates directly and indirectly to the Malaysian which influences up to more than 140 industries and 32 million people. Due to the importance and core position of housing sector in the economy, it has to be alert that the diverging of short-run house price from its equilibrium would strike the economy significantly in long-run. As an example in Malaysia, early period of 1990s had experienced a little diverging of short-run house price over its fundamental value (Yong, 2000). In mid-2009, scholars found that housing market in Malaysia experienced a steeper and continuous upward increment of house price in Malaysia. This implies a crucial role of policies such as interest rate, government development expenditure and housing scheme on short-run house price did not work efficiently.

Furthermore, the problem in housing market also relates to a continuous increase in short-run house price that finally leads to housing bubble. The Malaysian house price experienced a gradual climb since 1980s. The high level of house price could cause housing bubble. This housing bubble implies a disaster in an economy which eventually brings negative impacts such as financial crisis after bubble bursting (Caballero & Krishnamurty, 2005). The bubble caused a short-run effect where Malaysian house price exceeds the logical price range as a result of the public justify the price increases in the future without accordance of house price's fundamental value. The bubble bursts in housing market would yields financial crisis. The subsequent effect would be followed by currency crisis, banking crisis, and stock market crisis as the housing sector is connected to most of the parties in financial system. It is therefore important to investigate Malaysian housing market to identify the existence of bubble base on the hiking of house price over the years.

1.3 Research Question

As discussed in the problem statement, the research questions are developed as follow:

i what are the effect of interest rates and government development expenditure on house price in Malaysia in the long run?

ii what are the effect of interest rates and government development expenditure on house price in Malaysia in the short run?

iii did Malaysian housing market experience housing bubble?

1.4 Objectives of the Study

The general research objective of this study is to investigate the house price in Malaysia.

i to explore the effect of interest rates and government development expenditure on house price in Malaysia in the long run.

ii to examine the effect of interest rates and government development expenditure on house price in Malaysia in the short run.

iii to identify the existence of bubble in Malaysian housing market.

1.5 Significance of the Study

This research contributes some insights with regards to the influence of policies on house price in Malaysia. In the end of the research, outcome of the study become very useful for policy-makers, investors, buyers and sellers in housing market as the issue of house price represents as one of the core ingredients in Malaysian housing market. The outcome of this research helps to explain the behaviour and trend of Malaysian house price over the 34 years and identify the stability of Malaysian house price under policies in order to capture the bubble existence in Malaysian housing market.

Besides, this research proceeds analyses and identifications to the Malaysian house price which aims to explain the trending of Malaysian house price and underlying bubble in Malaysian housing market so that a clear vision of government efforts in Malaysian housing market can be revealed. This can also provide a better overview of house price in Malaysia by understanding its boom and burst process that helps to design better preventive measurements.

1.6 Scope of the Study

This study focuses on the influence of interest rates and government development expenditure on house price in Malaysia. This area builds a solid and fundamental platform for this study to examine the situation of Malaysian house price under government effort. In order to identify house price in Malaysia, the period of the analysis takes 34 years from 1985 until 2018. This period is important for capturing the movement and trend of Malaysian house price effectively as it consists the annual data that underwent AFC in 1997 and GFC in 2008. Therefore, it is believed that the scope contains some important message and information that explains the behaviour of Malaysian house price and to identify the existence of housing bubble under policies in Malaysia.

1.7 Organization of the Study

There are five chapters written in this study. Chapter One discusses about background of the study, problem statement, research questions, research objectives, scope of the study, significant of the study, and organization of the thesis in this chapter. Literature reviews is presented in Chapter Two. It presents theoretical and empirical review of previous studies of house price and policies in Malaysia. Several variables are discussed in a detail and informative way by taking references from the previous literatures in the

related topics. Chapter Three explains the methodology of the study that mainly discusses construction of house price model, data, and methods of analysis. Finally, the results of the analysis are discussed in Chapter Four, while Chapter Five presents the conclusion and recommendation for the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The following parts in this chapter present literature review with regards to house price and housing bubble based on different discussions of previous studies. This chapter focuses on delivering information and critical appraisal with regards to theoretical and empirical review of house price. The theoretical and empirical review help to strengthen this study with concrete evidence. This chapter is divided into several parts; theoretical review, empirical review, literature gap, and conclusion.

2.2 Theoretical Review

The theoretical review presents the relevant theories that explain the relationship between the interest rates, government development expenditure, house price, and housing bubble. It includes theory of demand, housing cycle theory, and bubble theory. However, these theories only focus on the demand side. This is due to the fact that the supply side in the housing market has limited and inelastic influence in the short-run (Zainuddin, 2010).

2.2.1 Theory of Demand

Theory of demand is important in this study as it describes the relationship between the interest rates, government development expenditure, and house price in Malaysia. According to Pindyck and Rubinfeld (2013), the theory of demand explains the willingness or quantity of consumers to spend as the price of given goods change. Generally, this theory describes a negative relationship between quantity demanded for

a good and price of the good. This means that as the price of the good decreases, quantity demanded for the good will increase and vice versa.

Meanwhile, there are also other factors that can influence the demand. According to Singh (2014), these factors influence the consumers' decision to purchase a good regardless of the price of the good. Some factors given by Singh (2014) and Shikha (2018) include income, consumer preferences, expectation of future, and affordability. Thus, consumers would decide to purchase a good if these factors can positively drive their demand for a good.

Theory of demand explains that interest rates influence the demand for houses through its feature as cost of borrowing, which relates to affordability in the theory of demand. People purchase houses for two purposes, own-used and investment. Therefore, cost of borrowing relates tightly to home buying and investment activities. The cost of borrowing refers to the interest rate that charged by financial institutions or banks on the total funds provided to borrowers. Under given agreement, the borrowers have to pay back the entitled interest rates periodically in order to sustain the loans. Therefore, the cost of borrowing can directly affect the decision of buying a house because higher interest rates reflect higher cost of owning a house.

According to Kagen (2018), as the interest rates decrease, the profit gained from an investment activity increases because the borrowers only have to pay back in a relatively lesser amount of the interest rates being charged. This indicates that lower interest rates of getting a loan from banks can increase the profits gained in short-term or long-term investment to the investors. When the cost of borrowing becomes lower, the investment activities will increase in order to maximize profits. Generally, the parties engaged in this activity are often referring to the depositors, bank or financial institution, and corporations.

The theory of demand explains the relationship between the quantity demand for houses and the costs of borrowing reflected by interest rates. The theory applied in housing market where the demand for houses can be affected by the interest rate. When the interest rates decreases, cost of borrowing will decrease. This situation will cause homebuyers and investors to grab the opportunity to buy houses at lower cost. Demand for houses will then increase. Assuming there is no changes in supply of houses, the increase of housing demand will finally lead to higher house prices in the market.

In addition, the theory of demand can also be applied in the discussion of government development expenditure and housing demand. As an area being developed nicely, homebuyers and investors will value the properties in the area even more. This leads to a higher housing demand that caused by the government development expenditure.

The demand for houses not only happen in the cities, but also to the areas around. This is due to the expansion of development to outskirt areas and suburban areas that caused by the cities growth. In other words, the cities growth bring impact to the areas around because of the connectivity and infrastructure system in between the areas and cities. According to Fava (1962), the peripheral areas grow because of the increasing economical and sociological activities in the cities such as high population density, connectivity level of infrastructure and transportation, increasing demand for urban land and house prices.

People who work in the central urban area nowadays can opt to stay in satellite communities or suburbs and commute to work by using public transportation or mass transit. This is due to high house price and less supply of houses for people to stay in the central urban area. In addition, the expansion of government development in providing infrastructure and facilities that enable people to work from home or taking public transportation like bus services, LRT, and MRT has changed the lifestyle of people.

Eventually, the suburb areas around the central cities will be benefited and become more prosperous due to the expanding benefits given in the cities, such as public transportation system, infrastructures, and expanding development projects to the areas around.

Hawtrey (1932) explained that the government development expenditure could cause price fluctuation, especially for the property inflation. He continued to describe that the economic growth that being supported by the development expenditure will raise prosperity in those regions. The connection between cities and rural areas will enhance the demand for houses or properties around because of the migration of people from other areas to the benefited areas given targeted by the government development project especially the suburbs around the cities. The situation happens in most of the cities where people demand more houses in cities or areas around cities in order to live in a better lifestyle. However, increasing demand for houses that accompanies with limited housing supply often drives the house price up. Hence, that government development expenditure improves the infrastructures and facilities in the cities and suburbs. This will increase the demand for houses that eventually increase the house price.

2.2.2 Housing Cycle Theory

The housing cycle theory further supports the theory of demand in terms of explaining the situation on how the housing demand affects house price in Malaysia. This theory is discussed by Feng *et al*. (2010) that demand and supply can influence the house price through the vacancy rate and intensity of owning houses in a market. This theory says that house price fluctuates in a cyclical way that demand force drives to housing shortage in a market. When this happens, house price and renting will increase because more people are looking for limited units in the market. People tend to offer higher

price in order to own a house. According to Lim *et al.* (2017), this will encourage investment in housing market as the people in the market see future value of house price increases because the stagnant of housing supply in short run does not accommodate the housing demand. However, the supply of houses will increase because of the increasing housing demand in the future. If the supply of houses increase more than the increasing rate of demand for houses, the housing price and rent will slow down or decrease. Housing cycle theory states that this cycle will repeat base on the circumstances of demand, supply, and expectation.

2.2.3 The Theory of Housing Bubble

Housing bubble refers to a situation where price of houses hikes and reaches a level that there is no reasonable fundamental factors or determinants to explain how it works. According to Shiller (2007), a continuous rising of house price might present housing bubble. The reason behind that is mostly due to people have higher price expectation toward the housing sector in the future and increase their current demand for houses (Stiglitz, 1990). Kritayanavaj (2008) also described bubble as an over-rising of asset price from the market fundamental value that it should be.

The housing history had recorded a few financial crisis in several countries such as the US, the UK, Spain, Japan, and others (Glindro *et al*., 2007). A common scenario of those financial crisis is hiking of house price continuously. The issue has attracted many scholars to examine the reasons behind it and identify bubble in housing market. It also brings attention of international organization such as Bank of International Settlement (BIS), International Monetary Fund (IMF), and Organization for Economic Cooperation (OECD) to concern about the trending of house price (Gyntelberg & Remolona, 2006).

Furthermore, Kinderberger (1987) said that the housing bubble refers to a rapid rise of property price within a short and continuous period. This is a short-run process where property price exceeds the logical range due to reasons such as speculation. It also happens when the public expect house price will increase in the future without taking consideration of fundamental value into account. Once their optimistic future expectation blows up, house price drops and it might cause financial crisis (Duus & Hjelmeland, 2013). This point of view is very similar to Lawrence (2008) who mentioned that housing bubble's disaster refers to a temporary rise and drop of a property price. The effect of housing bubble can cause extremely expensive payoff for the economic entity (Belke & Wiedmann, 2005).

The housing bubble reflects the market atmosphere where higher price is caused by people's sentiment and expectation of future price (Case & Shiller, 2003). The idea matches with Knight (2002) who defined it specifically in housing market that bubble is a situation when house price rises sharply and become unsustainable with current economic condition. This simply means that the market starts to become irrational and people who make transactions are speculating the house price base on their expectation towards the future value, without depending on the economic fundamental factors like GDP, inflation and interest rates (Malpezzi & Wachter, 2005).

According to Thomsett and Kahr (2007), housing bubble can be categorized into three different stages, which include bubble inflating, bubble bursting, and bubble crisis. Bubble inflating stage is a stage where there is an expanding monetary policy provided in the housing market. During bubble inflating stage, the market expands due to liberalization of financial system. Restriction of lending and credit policy becomes lower in order to stimulate homebuyers to purchase houses (Thomsett & Kahr, 2007). Therefore, bubble starts to incubate when people find out the houses are much more affordable.

One of the expanding monetary policies refers to decreasing of interest rate. It reduces the cost of owning a property and thus creates housing demand from better investment opportunity in housing market. Due to the rising of housing demand with the limitation of housing supplies, the house price goes up. Housing bubble is forming without any obvious indication. When housing demand rises, property holders and investors often believe that their assets are managed to be resold to others at a higher price especially during bubble period. At the same time, new buyers believe in the housing market and obsess the same as the investors to own a property to make profits. However, high house price will drive ordinary people to feel unaffordable to continue the deal and the market is starting to be dominated by investors and speculators (Kritayanavaj, 2008). House price will keep create higher record when there are irrational behaviors from the demand side until it reaches its peak (Thomsett & Kahr, 2007). This is explained by Zainuddin (2010) as the market sentiment of expecting future house price will be even higher. The market is in a situation called 'over-booming' where people are willing to pay at a higher price than the fundamental value (Thomsett & Kahr, 2007).

The next stage is bubble bursting, which follows after the bubble is created. It happens when the previous stage continues to expand until the market reaches its highest house price level or saturation point. At the saturation point, demand for houses becomes lesser as price goes up and transactions slowdown in the housing market due to unaffordability of investors and homebuyers to demand for more houses (Blanchard & Fisher, 1989). The market would start to slow down as it is indicated by a longer time for housing transaction being made (Kaiser, 1997). Meanwhile, the housing projects or constructions that continuously run by developers causes an excessive supply of houses in the housing market. This situation leads to an even slower of the transaction's turnover speed. This will eventually make the financial institutions or lenders alert of

providing any further housing loans into the housing market (Zainuddin, 2010). Bubble in housing market will reach stagnation and burst, which was resulted by the Asian Financial Crisis in 1997 in Malaysia that caused a decline of 35 percent in housing transactions, reduction of 48 percent of the housing values, and a surplus of 900,000 housing units (Bank Negara Malaysia, 2000).

The final stage is bubble crisis. Due to the previous bubble inflating and slowing down of market after reaching a peak, market enters recession. The bubble crisis is mainly caused by the imbalance between the housing supply and housing demand (Kritayanavaj, 2008). Therefore, the market can only reach its equilibrium by moving down the house price when housing supply is more than housing demand. During the bubble crisis, housing developers and investors become worried as people who are willing to pay at a higher price are reducing. This time, the one who holds the houses or properties bear the losses as they purchased it at a higher price but its values become lower and lower during bubble crisis.

The slowdown of housing market during the bubble crisis is also caused by the restriction of financial institution to their credit policy in order to control the market and financial system (Mar Iman, 2002). The situation can turn out to reduce the housing demand as the cost of borrowing rises. Therefore, price goes down as housing demand goes down and there are more and more unsold properties occur in the housing market. The idea was supported by Kritayanavaj (2008) that excess supply of houses pulls down the price. The crisis starts when there are too many cases of default of firms, investors, and homebuyers who bear the debts in the housing market during bubble inflated period.

One of the example of housing bubble can be described in the Japanese housing market in 1986 during the hiking period of Japanese yen and easier approach to finance mortgage (Cargill *et al*., 1996). According to Cargill *et al*. (1996), this had subsequently caused the property price tripled within few years in end of 1980s as that was caused by

cheaper financing costs, trading surplus and stronger yen that gave Japanese more purchasing power. However, everything turned down after the bursting of bubble economy in Japan by 1990. It brought a tragic loss to many parties which included the losses of USD9 trillion in housing and stock market due to the decline of property value.

2.2.3.1 Indicators and Signals of Housing Bubble

There are many indicators and signals of the housing bubble. Sanchez (2003) said that housing bubble can be identified through several indicators and signals such as temporary increase and decrease of house price that cannot be explained by fundamental variables, speculative activities that formed by increasing capital gain in housing market, and actively purchased of houses by buyers. There are also some other indicators and signals that used to measure situation in real world. For instant, several Northeast cities in the US such as Boston, Nassau-Suffolk and Newark had their real house price rose by 92 percent within 1983 to 1988 and decreased by 25 percent after 1993 (Abraham & Hendershott, 1993). At the same time, there were 11 west coast cities in the US experienced increasing in real house price by more than 50 percent from 1984 to 1990 and dropped by 15 percent after 1990 (Abraham & Hendershott, 1993). The situations matched with the explanation of Mayer (2011) that bubble exists in a housing market when there is any increase of house price for over 20 percent or 30 percent within two to three years and falls at the same rate after reaching its peak for the next two to three years. Additionally, bubble often ends up bursting due to its irregular pattern that not being supported by fundamental factors (Kindleberger & Aliber, 2005).

The examples of those indicators and signals can be represented by a sharp rise and drop in the house price that are unexplainable by our common economic fundamental determinants (Sanchez, 2003). This type of situation can happen when there is a market hype in housing sector that stimulate more and more people to

speculate as a result of their psychological excitement towards the increasing expected price in future (Case & Shiller, 2003). On the other hand, according to Thomsett and Kahr (2007), the over-supply of houses during bubble period also leads to a significant rise and decline of house price in the market within a short-run period. To discuss over-supply, the most optimal housing stock often stands for six to 12 months that ready for the market demand, over-supply is therefore being defined as any increasing supply of houses for more than the availability amount of 12 months (Thomsett & Kahr, 2007). Other than that, a volatile housing market in terms of trading or transaction could also have a possibility of bubble existences as it changes faster than the fundamental changes (Mayer, 2011).

Generally, people's expectation on the increasing house price in future will always be the most significant indicator of showing the existence of housing bubble (Shiller & Case, 2003). When the market started to show an increasing amount of housing loans or lending schemes for houses, the housing bubble starts forming (Zainuddin, 2010). At the same time, there are other signals such as liberalized loan conditions, interest rates, overpriced properties, and market sentiments towards housing sector to significantly drive the booming and bursting of bubble in the sector (Bordon & Jeanne, 2002).

2.2.3.2 Impacts of Housing Bubble

The most significant impact of housing bubble that always happens is the slowdown of economy activities than usual period which includes consumption, investment, wealth, and government projects (Pollin, 2005). For example, the bursting of housing bubble in the US caused a drop of eight percent in the country's GDP (Malpezzi & Wachter, 2005).

This impact of housing bubble also explained by Case *et al*. (2001) that the proportion of personal wealth and lending institutions in the system are chaining each other. Banking system will be the most affected one since its operations tightly related to housing market. According to Caprio and Honohan (1999), the expansion of bank lending to the housing market contributes to the bubble as more housing demand created. People get their loans easier and use the loan for investing in property market. However, bank failure happens when people start to realize that they are unaffordable to pay back the interest rates and choose to default themselves. The money of the bank 'evaporate' and they stop their business in a short time. Kaminsky and Reinhart (1999) examined housing market in several countries such as Japan, Norway, Finland, Sweden, Mexico, and East Asia had encountered collapsing housing market due to over-expansion of bank lending. In that case, any significant default in the banking system will definitely strike the system badly. Eventually, the burst of bubble affects the economy system includes consumers, investors, financial institution, government policies, housing constructors, and others related parties.

2.3 Empirical Review

2.3.1 House Price

House price represents as the cost of buying and selling a house. The house price is a crucial component in a country where it can lead to a better policy direction in order to ensure the people to have equal chance to purchase appropriate houses. According to Kagie and Wezel (2006), house price is being measured by using house price index (HPI). There are many scholars and statisticians agree on this because the HPI represents a calculation methods that takes property characteristics and locational attributes into the consideration (Portnov *et al.*, 2006). The HPI is generated by using

hedonic price method (HPM) and it is in percentage that capture the changes of house price between base and current years (see Appendix A).

Based on the review by Tze (2013), house price in Malaysia has increased gradually in most of the cities and suburb areas. Her findings showed that hiking of Malaysian house price is out of sync with the annual income increases in the population. This situation causes Malaysians become harder to purchase houses because of lower affordability to own it. This is supported by JPPH (2015) that the average house price in Malaysian has increased continuously from 2000 to 2010 by 45 percent. The house price in Malaysia increases gradually every year. Studies by JPPH (2015) also revealed that this situation is due to the increment of standard of living and advancement of infrastructure and public facilities especially in cities and suburb areas around. According to Myrmo (2012), the attractive housing units in the market increased the investment opportunity that boosts up the housing demand. This situation can accelerate the house price to increase in the short-run.

2.3.2 The Relationship between Interest Rate and House Price

Interest rate is viewed as a cost to own a house. It is measured by the percentage. This situation is due to the monthly instalment that a house owner has to repay for the housing loan. Therefore, it is generally treated as a variable that has a negative relationship with house price. According to Zhu (2006), when the interest rate increases, the monthly instalment payment by house owner will be high. This situation will reduce homeowners' to buy houses. In a cross country analysis that include 17 countries, Zhu also concluded that homeowners tend to concern more on monthly payments than the total house loan paid. Therefore, Zhu concluded that there is a significant relationship between house price and interest rate.

The study on the relationship between interest rate and house price in Malaysia also done by Pillaiyan (2015). Pillaiyan concluded that there is an inverse relationship between interest rates and house price (Pillaiyan, 2015). The relationship was also proven by Thomsett and Kahr (2007) that lower interest rates makes people more eligible to bear a housing loan by a reduction of mortgage payment, therefore the demand for houses would increase and drive the price up. In a study by Ramazan *et al.* (2007), interest rate brings more crucial impact to affect homebuyers' decision in developing countries compared to developed countries'.

Furthermore, the analysis of Jud and Winkler (2002) in a total of 130 cities in America showed that the real interest rate significantly affect the house price from 1990s to 2000s. Citizens tend to invest more when the interest rate become lower, such as buying houses (Tze, 2013). Besides, Tze (2013) stated that it is an important consideration for the homebuyers as interest rate does not only impact directly to house price, but also affect capital availability and investment in housing market. Interest rate is therefore representing as a common factor to influence house price and housing demand (Cheng *et al*., 2009). Economists also believe that the driving force behind the booming of housing market in the US was due to low interest rates, poor lending standards and market sentiment that forming the trend of owning a house as investment or own usage (Krinsman, 2007). In an empirical result, Mansur and Elyasiani (1995) found that there is a significant negative long-run relationship between interest rate and Malaysian house price. Thus, it is summarized that interest rate has a negative relationship with house price.

2.3.3 The Relationship between Development Expenditure and House Price

Development expenditure is one of the government expenditure that can influence Malaysian house price. The development expenditure is measured by budget or fund in

terms of ringgit Malaysia. The budget is allocated by Malaysian government in order to develop various aspects such as infrastructure, pipeline and electricity, public facilities, roads and bridge as well as public transportation in rural and urban areas. The government development expenditure can increase the house price in different ways. According to a study in Athens by Efthymiou and Antoniou (2012), development expenditure can improve the transportation system in different regions. This does not only enhance the connectivity between the cities and suburbs, but also improve the economic activities in the country. The outcome of this study shows a positive relationship between development expenditure and house price. Furthermore, they stated that the areas with better infrastructure such as good public facilities and transportation had higher house prices and housing rents as compared to less advanced areas. In their study, they also found that the relationship between development expenditure and house price is subject to the comfortable level of living such as noise areas around airport have less demand and insignificant level of high house price and housing rents.

Nelson *et al*. (2008) found that every $1.00 increase in the government expenditure to fund for infrastructure and public transportation development, there will be an increase by $1.50 to $1.70 for the house price in the US for the past decade. Another finding in Brisbane, Australia shows that the development in infrastructure area by $1.00 can lead to an increase of $3.69 in house price (Bryant & Eves, 2014). Their results proved that government expenditure on developing infrastructure, facilities, and public transport in a region can effectively boost up the house price because of the suburbanization impact given in the cities and suburb areas that improve the standard of living.

On top of that, Estrin (2013) mentioned that public transportation represents as one of the most important factors that raise up properties value. His study shows that the

values of houses located within half-mile of public transportation had recorded 41 percent higher than houses located farther away. This result shows that transportation is important for homebuyers to make decision to buy a house. This matches with the empirical study in China, which present a positive relationship between development expenditure in public transportation and house price (Zhang *et al.*, 2016). In their panel analysis on housing prices and urban rail transit facilities for 35 Chinese cities, there is a finding shows that a one percent increase in rail transit mileage improves house prices by 0.023 percent. They explained that this relationship is caused by the development in urban areas as well as the population density that created higher housing demand. Finally in Malaysia, Kamal *et al.* (2016) states that location is the most important variable that affect the house price, followed by demographic and industry factors. Their finding also reveals that location of the project that equipped with better infrastructure, higher quality and better design specification can contribute to the increase of house price especially in the cities. Hence, the government development expenditure can positively influence the house price.

2.3.4 Housing Bubble

There are many different types of processes and methods that are used to identify housing bubble. According to Lind (2008), the most challenging part in building a house price model is regarding to the identification of the existence of bubble in the housing market. This is because it is vague to decide true fundamental variables that could build up house price model. The determination of fundamental variables relates tightly to the direction of analysis. For example, when it is related to macroeconomics analysis, researchers can use macroeconomic indicators such as GDP, inflation, and population (Tze, 2013). On the other hand, if the analysis is based on developers' perspective, researchers can always analyse the house price using specific factors such as demographic, location, and type of houses (Kamal *et al.*, 2016). Therefore, the results

would be different based on the interpretation from different approaches. This research, however, aims to analyse house price based on the influence of government policies such as interest rate, development expenditure, and housing scheme in Malaysia.

Housing bubble is proven to be a real issue in the economy. In fact, it becomes one of the main concerns for investors, policy makers, and economists in investigating and forecasting for the next housing bubble. There are a lot of researches discussed housing bubble and many of them had successfully showed the existence of housing bubble and managed to capture its characteristics. For example, housing bubble does exist as shown by the evidence of empirical studies (Zainuddin, 2010). Such examples of housing bubble are reflected in our real world in many countries as shown by the studies in Australia (Bourassa & Hendershott, 1995), Sweden (Hort, 1998), New Zealand (Bourassa *et al.*, 2001), London (Levin & Wright, 1997), Paris (Roehner, 1999), Dublin (Roche, 2001). The bubble that happened in some countries' housing market was proven by several researchers that the house price was severely diverged from the long-run price equilibrium, which was then caused the market collapses (Zhou & Sornette, 2003; Goodman & Thibodeau, 2008).

There are a lot of researches on the US housing bubble. One of the approaches that examined the boom and bust cycle in the US housing market using a reverse-engineering approach was presented by Gelain *et al.* (2018). Their result shows that boom-bust market can be analysed and being presented in a bubble-like growing in house prices (Gelain *et al.,* 2018). It had contributed to the data interpretation from 1993 to 2015 in the US housing market that how the economic shock brought impact to the housing market and what is the most significant variable that caused the highest value of standard deviation in the housing model. Meanwhile, many regions in the US were proven to experience housing bubble in the early 2000s. Regions such as Irvine, California that chosen by Clithero and Pealer (2005) was proven to experience bubble in

housing market, which matched the report of Office of Federal Housing Oversight (OFHEO) that it was a hike of 149.7 percent of price rate in the region.

After the housing bubble crisis happened in 2008 which was originated in the US, the UK economy had suffered the impact as well (Wu & Lux, 2018). However, within 10 years, scholars noticed that there could be another housing bubble occurs in the UK in 2017 as there had been another booming period shown (Wu & Lux, 2018). Based on their findings, house price in the UK, especially London showed a shift away of short-term housing prices from its long-term values. Specifically in 2009, the UK mortgage debt had increased gradually to $1.23 trillion due to the expansionary lending policies and low interest rate (Benamraoui, 2010). Speculative bubble was successfully tested in the research of Garino and Sarno (2004) and Zhou and Sornette (2003) in the UK's housing market. Zhou and Sornette (2003) discovered bubble and defined it as an accelerator of house price. They explained the situation as an exponential growth that refers to a straight line in linear-logarithmic plots. Their studies presented regions other than Midwest and South had a faster-than-exponential price growth in the period.

Housing bubble happens in Asian and East Asia countries such as Japan, Korea, Hong Kong, China, and Thailand. The China housing market substantial increases in house price during 1990s and 2000s. This phenomenon happened rapidly especially in the main city like Beijing housing market. Using fundamental variables such as interest rate, inflation, and cost of supply, Chen *et al*. (2013) found that Beijing has the highest HPI which has diverged from its equilibrium value. This deviation of house price represents as one of the indicators to show housing bubble as the price is being high in the short term (Yip *et al.*, 2016). China has experienced an astonishing growth due to the rising of housing demand, expansionary of credit terms, and oligopoly of the market (Qi & Li, 2004). This presents another divergence of house price in Shanghai that experienced bubble in 2003 (Shen *et al*., 2005).

Meanwhile in Korea, housing bubble occured during a rapid growth period of house price from year 1991 to 1993 and 2001 to 2002 (Kang, 2007). The major areas that experienced housing bubble are concluded to have most expensive price and rapid speculative activities during the period. Similarly, the Japanese housing market experienced "bubble economy" due to speculative activities in real estate. According to Colombo (2012), the rising of house price in Tokyo was once achieved a 350 times higher than the house price in Manhattan, New York.

Lastly, the findings of Malaysia housing market can be divided into two different sections which include house price in 1990s and 2000s in general. Malaysian housing market had experienced housing bubble in 1990s (Zainuddin, 2010). The most significant evidence was presented in the early 1990s where the market struck by AFC in year 1997. The unstable economy condition that caused by housing bubble was then directly affecting banking and financial sectors in Malaysia. In Zainuddin (2010) study, the result of Markov Switching Model showed that the market had a disequilibrium of house price in the 1990s. Specifically, there was a 30 percent deviation of house price from its long-run equilibrium averagely. However, the author also summarized that Malaysia housing market experienced a relatively weaker bubble compare to neighbour countries such as Thailand and Indonesia during 1990s (Zainuddin, 2010). Besides, Yip *et al.* (2016) mentioned that house price in Malaysia in 2000s does not seem like having significant result of bubble existence. They explained in their results that even though there it is statistical significance to say that Malaysian house price will be even higher in future, but their price stability test indicates a stable price cycle in Malaysia housing market. This means that Malaysia is not facing housing bubble yet in 2000s.

2.4 Literature Gap

Despite there are a lot of similarities of the interest of study such as the works by Zainuddin (2010), Lind (2008), Kvasnin (2016), and Karasu (2015). This research, however, manages to provide some different insights and perspectives in order to create an additional valuable reading material in this area.

Firstly, there are not much researches about house price in Malaysia that discuss based on the perspective from government policies, especially government development expenditure. This research, however, can fill up the gap to contribute new analysis and method of identifying house price and housing bubble in Malaysia. According to Lind (2008), it is vague to decide a fundamental variables that could exactly build up a house price model. This leads to difficulty in deciding a standard house price model. It is therefore presenting different models and variables as chosen by different scholars to analyze the house price. Thus, this research chooses several government policies such as interest rate, development expenditure, and housing scheme that are not being frequent used in previous literature for building a fundamental house price model in Malaysia. This study aims to examine the influence of government policies on Malaysian house price.

Based on the research of Lind (2008), there is no a specific way to determine which method is the best. Tools such as price-income ratio that measures the relationship between rent level and price level of houses can also be an identification of bubble existence (Taipalus, 2006). It is therefore difficult to determine the accuracy of each method to identify the bubble. Previous studies in Malaysian housing market were mostly focused on identifying house price determinants and housing bubble in the country. This study, however, constructs Vector Error Correction Model (VECM) to examine the long-run and short-run relationship of government policies on Malaysian house as well as identifying housing bubble in Malaysia. By doing so, this study also

hopes to fill up the gap between the literatures in order to contribute additional valuable information for the readers and future use by obtaining the actual and fitted value through the house price model. Then, this research uses price stability model that introduced by Yip *et al.* (2016) in order to identify housing bubble. It is a method that measures deviation of house price. Price stability model aims to discover the stability of house price in Malaysia, which is one of the methods used to identify housing bubble.

2.5 Conclusion

To summarize this chapter, it can be concluded that this research examines Malaysian house price with three chosen government policies which include interest rates, development expenditure, and housing scheme. Throughout this chapter, it also shows that housing bubble affects negatively to the economy and market. Its significant part is especially happening after the bubble period which strikes the economy. The discussion in this chapter shows that previous literature revealed government policies could lead to housing bubble when there is higher housing demand being created and causes higher house price.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter discusses theoretical framework, specification of model, justification of variables, data, and method of analysis. This chapter explores the variables used to build a fundamental house price model. It is also important for this chapter to justify each and every single variable with sufficient information in order to become valid determinants in fundamental house price model.

3.2 Theoretical Framework

There are three theories construct the framework in this research, which include theory of demand, housing cycle theory, and theory of housing bubble. These theories explain the impact given by the chosen variables towards the housing demand, whereby the housing demand will influence the house price and housing bubble.

Based on Figure 3.1, theory of demand explains that interest rate can affect the borrowing cost of investors and homebuyers to demand for houses in housing market. When the interest rate decreases, the borrowing cost will decrease because people have to pay lesser for their money borrowed from banks. Since the cost reduces, people will demand for more houses. As the market has higher housing demand, house price will go up, which is explained by the housing cycle theory. According to Robertson (1934), the theory of demand describes a process that involves fluctuation of the interest rate that affects the demand for a product. This can directly influence the investment and consumption activities. The decrease of interest rate will increase the loan being approved and released in the market. This can create higher housing demand for investment and home buying activities that eventually lead to higher house price. Nipun

(2018) stated that the reason is due to higher interest rate provides a higher cost for homebuyer to buy houses. This implies that a slight increase in interest rate could make a huge difference for homebuyers or investors to demand for houses. Therefore, a negative relationship appears between interest rate and house price. When the cost decreases, people would demand for more houses in order to buy houses easily and this will drive the house price up.

Additionally, the theory of demand explains the house price from the perspective of government development expenditure. The theory states that the development expenditure in infrastructure and public facilities that bring convenience and connect people from different areas from cities to suburb areas. This process can enhance the prosperity in the regions around the cities. The government development expenditure in Malaysia that enhance the regions in terms of infrastructure and facilities include the traffics, roads and public transportation in multiple states. This becomes one of the considerations that provide better consumer preference to buy houses when government puts efforts in developing the infrastructure and public facilities in those relevant cities and suburb areas.

Development expenditure by government can positively influence house price. This relates tightly to the value increment in a region and attract even more demand force for properties. According to Dargan (2014), development expenditure affects the property price by better value in the housing area through the infrastructure and public facilities. Thus, development expenditure in infrastructure plan and project announced by state or federal government can actually boost up the property price in a region. For instance, an expressway that connect two cities or suburb areas can drastically boost up the economic activities between the areas by shortening the time consuming and cost of doing businesses. It makes the properties around the transport projects become more valuable and create higher demand force. As the government development expenditure

increases, there will be better infrastructure and public facilities provided around the cities and suburbs. This can increase the housing demand and drive up the house price. By getting higher housing demand, house price will increase. This falls under the housing cycle theory. The theory describes that higher housing demand will lead to shortage in housing market. Due to the limited supply of houses in the short run, house price will go up because people are willing to spend more for buying limited houses. They value the houses more important than its current price because in the future, they will need to pay even higher for buying houses. This scarcity causes the value of houses and house price increase.

Finally, it is the theory of housing bubble that describes the uncontrollable hike of house price in the housing market. The theory states that housing bubble occurs because there is an incredible increase of house price that reaches a level where there is no fundamental factors or determinants to support the foundation of housing market (Stiglitz, 1990). Based on Figure 3.1, two of the chosen variables, which includes interest rate and government development expenditure are the factors that can influence house price in the housing market. However, if the people in the market abuse the benefits given by banks and government, the demand force will overwhelm housing supply and cause the house price rises. Hence, the uncontrollable demand force without proper policies taken will cause the housing bubble.

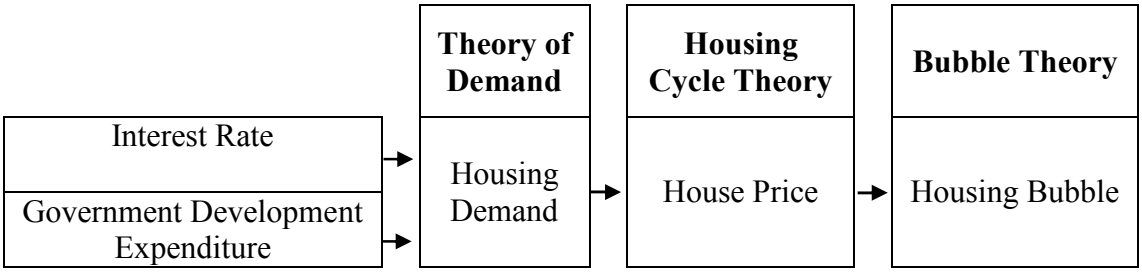

Figure 3.1:
Theoretical Framework

3.3 Specification of Model

To examine the influence of interest rate and government development expenditure on house price as well as housing bubble in Malaysian housing market, there are two models being developed in this study, which are house price model and price stability model.

3.3.1 House Price Model

The house price model is constructed by using *HPI* as dependent variable, while interest rate and development expenditure represent independent variables. At the same time, the analysis takes housing scheme, population, and GDP as control variables in this study. It is important to construct a house price model to find out the influence of interest rate and government development expenditure on house price for measuring the long run and short run relationship. The house price model in this research is constructed as shown in Equation [3.1]. This model is developed based on the studies of Lum (2004), Zhu (2004), and Zainuddin (2010).

$$HPI_t = \beta_0 + \beta_1 INT_t + \beta_2 DEX_t + \beta_3 HSG_t + \beta_4 POP_t + \beta_5 GDP_t + \varepsilon_t \qquad [3.1]$$

where, HPI = house price index (measured in percentage)

INT = interest rate (measured in percentage)

DEX = development expenditure (measured in RM)

HSG = housing scheme (measured in RM)

POP = population (measured in unit)

GDP = gross domestic product (measured in RM)

β_i = coefficients, where $i = 0,1,2,3$

ε = error term

3.3.2 Bubble Model

The bubble model is constructed by using price stability model. The price stability model uses actual and fitted value that generated from vector error correction model (VECM) to measure the stability of Malaysian house price and identify whether the actual house price is beyond of the fundamental value that indicates housing bubble. It is crucial to construct a bubble model in order to find out whether Malaysian housing market experienced bubble from 1985 to 2018. The bubble model in this research is constructed as shown in Equation [3.2]. This model is developed based on the studies of Yip *et al*. (2016).

$$\Delta p_t = \alpha \Delta p_{t-1} + \beta (p^*_{t-1} - p_{t-1}) + \gamma \Delta p^*_t + \varepsilon_t \quad [3.2]$$

where, Δp_t = changes of log of real house price (measured in RM)

Δp_{t-1} = previous changes of log of real house price (measured in RM)

$p^*_{t-1} - p_{t-1}$ = difference between previous log of fundamental house price and

previous log of real house price (measured in RM)

Δp^*_t = changes of log of long run house price (measured in RM)

α, β, γ = coefficients

ε = error term

3.4 Justification of Variables

In this session, variables are justified in order to explain the reason of choosing them as a component in fundamental house price model.

3.4.1 House Price

House price is the price of house that marked for sale. It often refers to a total amount of money that a house or property may be bought or sold. House price is often being measured by *HPI* (Lum, 2004). According to Zainuddin (2010), HPI in Malaysia is generated based on hedonic price method (HPM). Due to the simplicity of calculating *HPI* by using HPM, many statisticians and researchers tend to study *HPI* by using this method (Kagie & Wezel, 2006). This is due to the fact that HPM is much more precise compare to other methods as it takes building characteristics and locational attributes into account (Portnov *et al*., 2006). Other than that, HPM also represents as one of the popular calculation to measure data in other fields such as agriculture (Brorsen *et al*., 1984), residential assets (Kagie & Wezel, 2006) and others. Similarly, Kagie and Wezel (2006) used HPM to generate *HPI* like Halifax HPI and Nationwide HPI due to its comprehensive attribute in research areas.

The HPI in Malaysia was constructed from 70 sets of sub-indices by JPPH. This indices include national HPI, state HPI, and five house type sub-indices such as terraced, semi-detached, detached, high-rise unit, and others. Also, Malaysian HPI covers up to 13 states and two federal territories in order to present house price of Malaysia in a long-term figure (JPPH, 2016).

Therefore, Malaysian HPI can represent the behavior of house price in Malaysia as it manages to capture the characteristics of housing market which include illiquid behavior (Hilbers *et al*., 2001), short-term speculation (Davis & Zhu, 2004), and long run duration (Wang & Yi, 2005). *HPI* revised housing index according to geographical stratification as well, which considering clusters impact of housing characteristics.

In the house price model of this research, the *HPI* takes macroeconomic factors into account as those are the core instruments affecting house price. In this research, house price is measured by *HPI* in Malaysia from 1986 until 2018. According to

National Property Information Centre (NAPIC) (2017), Malaysian HPI represents as the change of prices that used to pay for an average house. The index measures the ratio of housing cost changes between base and current year (see Appendix A).

3.4.2 Interest Rate

Interest rate (*INT*) in this study refers to base lending rate in Malaysia. It refers to a rate determined by banks according to how much it costs to borrow money from the bank to buy houses. It is common to claim that interest rate represents as the rate of charging by a lender to a borrower for a particular amount. It is frequently used by many researchers in finding out the relationships between house price and interest rate. In many previous studies, interest rate is measured in percentage, which plays as a unit of measurement for the cost of getting loan in housing market.

Interest rate relates tightly to house price. This variable is used by many previous studies as one of the key factors that influence house price such as Thomset and Kahr (2007). Cheng *et al.* (2009) proved that interest rate plays a significant role in affecting house price and consumption in a country. A lower interest rate provides a lower cost of repaying debt by home buyers and investors. This relates to banking exposure to the real estate where the low interest rate provides more money supply to the housing market, housing demand will become higher. According to Rangel and Pillay (2007), the phenomenon of increasing housing demand would raise the house price in future, which resulted by easier financing and lower mortgage repayment.

According to Roehner (1999), interest rate is believed to be used as a significant consideration for home buyers and investors to purchase a house or property. The results match with many other studies that used interest rate as one of the key factors to explain and forecast house price (Muellbauer & Murphy, 1997). Singaporean housing market presented a negative relationship between interest rate and house price (Lum,

2002). The result further revealed that lower interest rate causes speedy property market's growth from 1975 to 1995 in Singaporean housing market.

Zainuddin (2010) mentioned that interest rate is justified in the house price model because it has information relates to real condition of the Malaysian housing market and controlling floating rate of mortgages market used in Malaysia. This is important as discussed in the study of Tsatsaronis and Zhu (2004) that interest rate becomes a standard for mortgage financing especially in floating mortgage market.

Thus, interest rate represent as a crucial factor that measure house price through the demand side not only from home buyers, but also from investors (Zainuddin, 2010). This research hypothesizes that interest rate has a negative relationship with Malaysian house price.

3.4.3 Government Development Expenditure

The Malaysian government has two kind of expenditure, which include operating and development expenditure. In this study, the development expenditure (DEX) is adopted in order to construct the house price model. Generally, development expenditure in Malaysia consists of defense and security, economic services, social services and general administration (See, 2015). To describe development expenditure in this study, the values taken only include infrastructure and public facilities that can explain the housing market closely. Meanwhile, the unit of measurement for development expenditure will be in ringgit Malaysia for this study.

Development expenditure is being argued to have a positive relationship with house price (Bryant, 2015). This is mainly because of the value increment in the cities and suburbs around. In a study of transport infrastructure and house price in Athens, Efthymiou and Antoniou (2012) found that distance between infrastructure and house price is significantly related. This is shown by some examples in their study that houses

located within 500 meter are having higher prices and housing rents compared to houses with longer distance. Similarly, their study also found that tram and bus station play an important role in affecting the house price positively (Efthymiou & Antoniou, 2012). Thus, this presents a direct positive relationship that house price is sensitive to the development expenditure in terms of infrastructure and public transportation. The situation is especially significant in comparative analysis between rural and urban areas. As the urban area always have higher expenditure on infrastructure and public transportation development, it causes a significant increment on the house price. Therefore, the higher demand for houses in urban areas always results a higher house price compared to rural areas (Stohldreier, 2012).

On the other hand, the house price in suburb areas around the cities will also be affected through government development expenditure. The government effort in developing more infrastructure and facilities that connect the cities and suburb areas can increase the value of properties around due to higher demand for houses in both cities and suburb areas surrounded. According to Tan (2017), one of the state government in Australia, which is New South Wales (NSW) has higher charge housing developers for $369.00 million Local Infrastructure Growth Scheme for infrastructure and public transportation development in new housing precincts for areas around the cities. Similar situation happens in Malaysia where public transportation that being developed in Selangor has caused the state to have continuous increasing house price since 2009 (GPG, 2017). This showed that infrastructure and public facilities establish connection and convenience for people to work in cities and suburb areas around. People will therefore demand for houses in the benefited areas and eventually push up the house price. Hence, this hypothesizes that higher development expenditure leads to higher house price.

3.5 Data and Sampling

This research employs secondary data. The sources of data comes from three official websites of Malaysia which are National Property Information Center (NAPIC), Ministry of Finance in Malaysia and Department of Statistics Malaysia. In this study, the analysis of the collected data is conducted in a time frame of 34 years from 1985 until 2018.

3.6 Method of Analysis

Time series analysis has become the method of analysis of this research. It aims to set up important analyses to examine house price in Malaysia and identify housing bubble in Malaysian market. In this study, VECM represents the methodology to measure the influence of interest rate and government development on housing price in Malaysia, while price stability model represents the methodology to measure housing bubble in Malaysia.

3.6.1 Vector Error Correction Model

VECM is always used to measure the data in multiple time series models for a long-run stochastic trend. It is a theoretically-driven approach that can estimate long-run effect, short-run effect, and speed of adjustment to house price equilibrium. The error correction term is helpful in explaining the last period deviation from a long-run equilibrium and shows the short-run dynamics. Based on the given outcome of VECM model, it can also explain the speed of adjustment of the dependent variable that returns to its equilibrium after some changes in other variables.

The house price model has been analysed using VECM. The VECM model is established in this section in order to examine the influence of interest rate and government development on housing price in Malaysia. The short-run relationship is presented in Equation [3.3].

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \Gamma_i \Delta Y_{t-1} + \sum_{i=0}^{n} \beta_i \Delta X_{t-i} + \emptyset Z_{t-1} + \mu_t \quad [3.3]$$

where ΔY_t = change in house price

Z_{t-1} = error correction term

β and Γ = coefficient matrixes jointly to be estimated in the VECM with p lags.

Y_{t-1} = a vector consisting a macroeconomic variables such as interest rate, development expenditure, housing scheme, population, and GDP.

ΔX_{t-i} = constant variables

μ_t = independently and identically distributed random error term vectors

The short-run influence of the interest rate and government development on housing price can be seen through the coefficient of the first difference sum. The ECT represents the speed of adjustment to the long-run equilibrium of house price. Under the result of VECM, a negative value ECT means that the model reverts to a long run house price equilibrium, while positive value ECT means that there is a sustained deviation of house price from its long-run equilibrium. The VECM model can be estimated and build a house price model to generate fitted value for price stability model, which is discussed in the next session. Prior to the estimation of VECM model, there are several tests to be run in order to verify the VECM approach.

3.6.1.1 Stationarity Test

The stationarity test is important to determine the variables to have zero mean value ($E(Y_t) = 0$), constant variance ($var(Y_t) = \sigma^2$), and zero covariance ($cov(Y_t, Y_{t-k}) = 0$). A model will be considered biased and inefficient to explain the real situation if it is not stationary. Unit root test aims to test stationarity in a variable. The test identify whether a spurious regression occur in a model. Augmented Dickey-Fuller (ADF) test is used to determine stationary of each variable. A non-stationary series is also described as having a unit root. ADF test is used to estimate Equation [3.4].

$$Y_t = \rho Y_{t-1} + \mu_t \qquad [3.4]$$

$$\mu_t \sim N\ (0, \sigma^2)$$

where Y_t is a general representative for *HPI*, *INT*, *DEX*, *HSG, POP,* and *GDP*. ρ is a coefficient which is expected as $-1 \leq \rho \leq 1$. This indicates that if $\rho = 1$, the chosen variable is non-stationary. The equation is subjected to have error term, μ_t to be normally distributed with zero mean and constant variance. Therefore, each equation above is needed to be regressed to find out ρ to detect stationary of each variable at level. The null hypothesis (H_0) states that variable has a unit root. If τ-value > τ-critical, the H_0 is rejected. This means that the variable is stationary at level.

Nevertheless, if a variables are not stationary at level, a differentiation has to be made on each of the variable as Equation [3.5]:

$$\Delta Y_t = \delta Y_{t-1} + \mu_t \qquad [3.5]$$

$$\mu_t \sim N\ (0, \sigma^2)$$

where Δ represents first difference operator and δ represents $(\rho - 1)$. The equation is subjected to have error term, μ_t to be normally distributed with zero mean and constant variance. H_0 is $\delta = 0$, which means that variable has a unit root. If τ-value > τ-critical, the H_0 is rejected. This means that the variable is stationary at first difference.

3.6.1.2 Lag Selection for the Model

Choosing optimal lag length is an important step before developing a VECM model. Lag selection for a model is very important as it represents as a criterion for a model selection process. This is due to the fact that a small lag length causes biased serial correlation in the errors or autocorrelated errors while a large lag length causes increasing in mean square forecast errors (Lutkepohl, 1993).

One of the criteria to be used to select lag length is Schwarz Information Criterion (SIC). The rule of thumb is choosing the smallest SIC value as it represents the best lag length for the model. SIC is chosen in this study because of its specification and concentration of selecting a fundamental house price model. SIC is chosen to decide an appropriate lag length in the model. According to Vrieze (2012), this is because SIC is argued to be more specific and suitable for selecting a 'true model', whereas Akaike Information Criterion (AIC) is less efficient of selecting true model especially for this research that aims to construct a fundamental house price model. After getting information by regressing the model, SIC criterion is generated as Equation [3.6].

$$SIC = n^{k/n} \frac{\sum \hat{u}^2}{n} = n^{k/n} \frac{RSS}{n} \qquad [3.6]$$

where k is the number of regressors (including intercept) and n is the number of observations. As a result that generated by SIC value, it can be interpreted as model

with lowest value of SIC is better among others. Therefore, SIC method helps in finding out best lag length that is consisted in a model.

However, the AIC method also used to provide a supporting result for the lag selection process. AIC criterion is generated as Equation [3.7].

$$AIC = e^{2k/n} \frac{\sum \hat{u}^2}{n} = e^{2k/n} \frac{RSS}{n} \quad [3.7]$$

where k is the number of regressors (including intercept) and n is the number of observations. As a result that generated by AIC value, it can be interpreted as model with lowest value of AIC is better among others.

3.6.1.3 Long-run Relationship Estimation

Johansen test of cointegration is a multivariate generalization of the augmented Dickey-Fuller test. The purpose of this analysis is to determine long-run relationship among variables in a model. Johansen test of cointegration is chosen for this study because it is a test for more than one cointegrating relationship and subjected to asymptotic properties (large sample size), while Engle-Granger and Auto Regressive Distributed Lags (ARDL) are not suitable because they are used for small sample size.

Johansen test of cointegration has to start from vector autoregression (VAR) with given number of lag ρ, the most suitable lag length which determined at previous lag selection process and present as Equation [3.8].

$$Y_t = \mu + A_1 Y_{t-1} + \cdots + A_p Y_{t-p} + \varepsilon_t \quad [3.8]$$

where Y_t represents vector of variables (HPI, INT, DEX, HSG, POP, GDP) that has same order of integration, which is commonly notified as I(1). A represents the matrix of coefficients, and ε_t represents n x 1 vector of normally and independently distributed error term. This VAR equation can be rewritten as Equation [3.9].

$$\Delta Y_t = \mu + \prod Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \quad [3.9]$$

where

$$\prod = \sum_{i=1}^{p} A_i - \mathrm{I} \text{ and } \Gamma_i = -\sum_{j=i+1}^{p} A_j \quad [3.10]$$

when coefficient matrix $\prod$ reduced rank where r < n. This means that there exists n x r matrices α and β with rank r respectively that leads to $\prod = \alpha\beta'$ and β'Y is stationary. In this context, r represents the number of cointegrating relationships. α represents adjustment parameters in VECM and each column of β represents cointegrating vector. For a given value of r, β explains the components of Y_{t-1} that forms r largest canonical correlations of ΔY_t and Y_{t-1}. All $\prod$ becomes zero when there is no cointegration in the variables. However, if rank $\prod = \rho$, then all variables are cointegrated.

The long-run relationship between variables begins with cointegration test. It aims to identify whether variables have long-run relationship. This study chooses Johansen Test of Cointegration as a method to determine cointegration between variables. This is due to the fact that its estimation strategy, which refers to maximum likelihood that can estimate all cointegrating vectors when there are at least two variables in a model (Dwyer, 2015). Generally, the number of cointegrating vectors is $n - 1$ where n refers to the number of variables that all have unit roots.

In this section, there are two different analysis used in Johansen Test of Cointegration: Trace test and Maximum Eigenvalue test. Trace test aims to test whether the rank of the matrix $\prod$ is r_0. This simply implies that H_0 is $rank \prod = r_0$ while

alternative hypothesis (H_1) is that $r_0 < rank \prod \leq n$, where n is the maximum number of possible cointegrating vectors. The rejection of H_0 indicates that variables are cointegrated or have long-run relationship. For the succession rejection of every H_0, the test will move on to the next H_0 where $rank \prod = r_0 + 1$ and the H_1 is that $r_0 + 1 < rank \prod \leq n$. Overall, the test determine the number of cointegrating relations r_0 sequentially from zero to $k - 1$ until fail to reject the H_0.

Next, Maximum Eigenvalue test examines whether the largest eigenvalue is zero relative to the alternative that the next largest eigenvalue is zero. It divides into two tests where the first test identifies whether the rank of the matrix $\prod$ is zero. The test sets H_0 to be $rank \prod = 0$ and the H_1 to be $rank \prod = 1$. The test repeats in a few times such that H_0 in subsequent tests become $rank \prod = 1,2, \ldots$ and the H_1 is $rank \prod = 2,3, \ldots$. The process of the test continues until the rank of the matrix becomes zero, where the largest eigenvalue is zero that implies there is no cointegration between variables.

3.6.2 Price Stability Model

One of the indicators of existing bubble in housing market is the instability of house price. Instability in this model means that the price fluctuates outside of the stable price range. According to Yip *et al*. (2016), a Price Stability Model (PSM) aims to capture the changes of house price in the short run. This is due to the fact that short run house price is affected by shocks to cause deviation and tends to converge to its fundamental values overtime. The model is useful for a confirmation of identifying the present of housing bubble in Malaysian market. In this circumstance, the result of this analysis would show a presentation of the bubble when the house price is instable and vice versa. Equation [3.11] shows a model for PSM.

$$\Delta p_t = \alpha \Delta p_{t-1} + \beta (p^*_{t-1} - p_{t-1}) + \gamma \Delta p^*_t + \varepsilon_t \qquad [3.11]$$

where Δp_t represents changes of log of real house price, Δp_{t-1} stands for previous changes of log of real house price, $p_{t-1}^* - p_{t-1}$ represents difference between previous log of fundamental house price and previous log of real house price, while Δp_t^* represents changes of log of long run fundamental house price which developed from the cointegration analysis. p_t is obtained from the very initial data of HPI, while p_t^* [1] is HPI series that generated from its long run fundamental house price model in VECM. The results of those coefficients α, β, and γ could lead to different interpretation of the model. For example, an efficient market that have relatively perfect adjustment of house price to its long run equilibrium will tend to have $\gamma = 1$ and $\alpha = 0$. This is due to the fact that there is no effect from previous changes of log of real house price (Δp_{t-1}) and the changes of log of real house price Δp_t is the changes of long run fundamental house price itself (Δp_t^*).

On the other hand, house price is stable when $\alpha < 1$ and $\beta > 0$. This can be explained by Equation [3.10] that on average, previous changes of log of real house price (Δp_{t-1}) has less effect on the changes of log of real house price Δp_t and this tends to represent a stationary series. Meanwhile, if $\beta > 0$, it means that averagely, the previous log of fundamental house price (p_{t-1}^*) is higher than the previous log of real house price, which means that the actual house price is underpriced and vice versa. However, if $\alpha \geq 1$, the series are non-stationary, and if $\beta \leq 0$, there could be a housing bubble in the market.

[1] p_t^* is generated from fitted value in VECM model in Equation [3.3].

3.6.3 Diagnostic Checking

Diagnostic checking is the last and important step to check for the validity of both models, which refer to VECM model and price stability model. The tests for diagnostic checking include normality test and autocorrelation test in this study.

3.6.3.1 Normality

A normally distributed residual benefit the researcher to obtain valid hypotheses, tests, and confidence intervals. The normally distribution have an important property, which is symmetric around its mean, zero mean. A Jarque-Berra (JB) statistic value is generated as Equation [3.12].

$$JB = n\left[\frac{\varepsilon_3^2}{6} + \frac{(\varepsilon_4 - 3)^2}{24}\right] \sim x_{df}^2 \qquad [3.12]$$

H_0 is residuals are normally distributed. If x_{df}^2-value > x_{df}^2-critical, the H_0 is rejected. This means that that the series is not normally distributed or not correctly specified.

3.6.3.2 Autocorrelation

Autocorrelation refers to a situation that there is a relationship between current error terms and previous error terms. It causes inefficiency to estimate a model since t-value and F-value becomes invalid to explain the result. A Breusch-Godfrey Serial Correlation LM test is conducted by estimating a chosen model, which in this case, refers to price stability model and obtain the error term. The residuals are used to estimate with independent variables and lagged value of error terms. This creates the result of F-statistic as Equation [3.13].

$$\text{F-statistic} = \frac{R^2/(K-1)}{(1-R^2)/(n-k)} \quad [3.13]$$

Null hypothesis is error term is not serially correlated. If F -value > F -critical, the H_0 is rejected, this means that that the error term is serially correlated.

3.7 Conclusion

This chapter ends up by summarizing the analysis of house price and method of identifying housing bubble in Malaysia. The chapter is about research methodology and its purposes are to ensure the research follows the steps in a planned and precise way. Besides, the specification and justification of variables are demonstrated in order to ascertain the scales of data that are going to be used. The analysis tools in this study includes VECM model and PSM model. Last but not least, proper models are presented and followed by techniques of data analysis to explore the environment of Malaysian housing market.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents empirical results which include descriptive analysis, correlation analysis, estimation model results, and diagnostic checking of the result. Among the methodologies as mentioned, Malaysian house price can be examined based on the chosen determinants in VECM model. On the other hand, housing bubble in Malaysia can be identified by using PSM. Finally, a brief recapitulation of those empirical findings is summarized in the conclusion.

4.2 Descriptive Statistics Analysis

Table 4.1 shows the descriptive statistics for variables in this study, which includes house price index (*HPI*), interest rate (*INT*), development expenditure (*DEX*), housing scheme (*HSG*), population (*POP*), and gross domestic product (*GDP*).

Table 4.1
Descriptive Analysis

	Mean	**Median**	**Maximum**	**Minimum**	**Standard Deviation**
HPI	118.562	105.608	250.100	43.758	61.233
INT	7.367	6.830	12.130	4.540	2.230
DEX	28.879	28.570	53.700	4.562	17.478
HSG	1.539	1.159	5.206	0.098	1.180
POP	24.165	24.287	32.471	15.883	0.515
GDP	519.619	369.807	1346.79	71.594	403.503

The results reported that *HPI*, *DEX,* and *GDP* have relatively bigger difference between their means and standard deviations, respectively as compared with other variables. This simply means that these variables have larger spread or dispersion of

data from the means. This indicates that *HPI*, *DEX,* and *GDP* have data that spread out in a wider range as compared to other variables.

4.3 Correlation Analysis

Based on Table 4.2, the result shows that all variables in the house price model are correlated to each other in a strong strength except for *HSG*. This is due to the fact that the variables have result more than 0.7, which shows a high correlation. As for the concern of this research, there is a strong correlation between *INT, DEX,* and *HPI*. Aside of the strength of correlation, Table 4.2 also reports the sign of correlation between *INT, DEX,* and *HPI.* The result shows that *INT* is negatively correlated with *HPI*, while *DEX* is positively correlated with *HPI*.

Table 4.2
Correlation Test

	HPI	*INT*	*DEX*	*HSG*	*POP*	*GDP*
HPI	1.000					
INT	-0.792*	1.000				
DEX	0.844*	-0.907*	1.000			
HSG	0.407*	-0.350*	0.294	1.000		
POP	0.942*	-0.881	0.955	0.426	1.000	
GDP	0.976*	-0.867	0.910*	0.352*	0.963*	1.000

Note: * significants at 5 percent level

4.4 Stationarity Test

Table 4.3 reports ADF result of each variable at level and first difference. The table shows that all variables are statistically insignificant at level, which means that these variables are non-stationary. After first difference, all variables become statistically significant, which means that they are stationary. Therefore, the variables are integrated at order one, I(1).

Table 4.3
ADF Unit Root Test

Variables	Level	First Difference
HPI	0.412	0.017*
INT	0.711	0.001*
DEX	0.735	0.008*
HSG	0.726	0.002*
POP	0.960	0.015*
GDP	0.965	0.001*

Note: * significants at 5 percent level

4.5 Lag Selection for the Model

Table 4.4 shows the result of lag selection analysis. Both SIC and AIC results show that two lag-length for the model specification is optimal in this study because these lag-length have the lowest AIC and SIC value. According to Lutkepohl (1993), optimal lag selection is important in determining sufficiency to avoid serial correlation among the residuals. Therefore, two lag-length is used for the estimation purpose in this research.

Table 4.4
Lag Selection

Number of Lag	SIC Value	AIC Value
0	64.636	64.359
1	53.823	51.279
2	53.221*	49.179*
3	54.452	50.215

Note: * significants at 5 percent level

4.6 Test for Cointegration

Table 4.5 shows the result of cointegration test using both Trace test and Maximum Eigenvalue test. It can be concluded that the result rejects H_0 of no cointegration at five percent significant level. Trace test indicates there is at most one cointegrating equation at the five percent significant level and it implies there is a long-run relationship exists among variables in this model.

In short, the results of both Trace test and Maximum Eigenvalue test show that there is at most one cointegrating equation at the five percent significant level and there is a long-run relationship discovered among the variables in this model.

Table 4.5
Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.*	Max-Eigen Statistic	0.05 Critical Value	Prob.*
None*	0.884	173.116	107.347	0.001*	6.945	43.420	0.002*
At most 1*	0.699	106.171	79.342	0.049*	37.211	37.164	0.049*
At most 2	0.584	68.960	55.246	0.060	27.154	30.815	0.132
At most 3	0.539	41.805	35.011	0.356	23.993	24.252	0.054

Note: * significants at 5 percent level

4.7 Long-run Relationship Estimation

Since all variables are stationary at first difference and cointegrated, a vector error correction model (VECM) is used to estimate long-run and short-run relationship of Malaysian house price and its determinants. VECM basically works to restrict the long-run behavior of endogenous variables to converge to its equilibrium while estimating short-run adjustment dynamics. The long-run estimation result is presented in Table 4.6.

Table 4.6
Long-run Relationship

Variables	Coefficient	Std. Error	*t*-statistic
INT	39.039	3.550	10.998*
DEX	2.224	0.639	3.479*
HSG	-21.749	3.186	-6.828*
POP	0.046	0.028	1.649
GDP	0.003	0.027	1.274
C	-1120.749		

Note: * significants at 5 percent level

The coefficient of *INT* is statistically significant at five percent level of significant since probability value is less than 0.05. Thus, *INT* is significantly affecting house price. *INT* has a positive relationship with Malaysian house price, which is indicated by the positive coefficient value. On average, when *INT* increases by one percent, Malaysian

house price increases by 39.039 percent and vice versa. However, the result of this study is contrast with the previous studies and theories. According to Pettinger (2017), it is possible to have situation where house price increases when the interest rates increase in a market. Pettinger explained that when such situation happens, confidence towards the housing market and rising of income per capita often play major role in the market, regardless of the variation in interest rates. One of the example was presented in the UK housing market where the prices hiked due to shortage of housing supply, housing demand was boosted even though government raised the interest rates. Meanwhile, Larock (2017) explained that it was a healthy economic environment which caused the rising of interest rate in order to counter the future price inflation. Therefore, interest rates in this case, become a by-product of positive economic momentum. Larock (2017) viewed this economics phenomenon where higher income per capita and employment rate increases the consumer confidence in housing market more than interest rates does. He also claimed that higher interest rates could be a sign of increasing confidence in future economic prospects.

On the other hand, the coefficient of *DEX* is statistically significant at five percent level of significant since the probability value is less than 0.05. Thus, *DEX* is significantly affect the house price. *DEX* has a positive relationship with Malaysian house price, which is indicated by the positive coefficient value. On average, when *DEX* increases by RM1 billion, Malaysian house price increases by 2.224 percent and vice versa. From the finding, it can be explained that when the Malaysian government expenditure improves the infrastructure and transportation in every region, house price will increase. This expenditure helps to enhance environmental conditions in housing market (Efthymiou, 2013). Based on the result of Efthymiou (2013), government expenditure on infrastructure and transportation helps in delivering direct impact on house price. The example can be shown by the city and rural development through

railway, bus stations, water and electricity. In a study of hedonic house price model, Bryant (2014) proved that government expenditure does increase house price in Australia. This is due to the fact that government expenditure on developing local roads, stormwater and community facilities and parks to regions help in creating higher value and convenience to the area. This can boost up the housing demand and further push up the house price. Similarly, Fava (1962) stated that the improvement of infrastructure and public facilities between cities and suburb areas around can lead to a rise in housing demand and house price. This is due to an increasing population density and suburbanization process that attract more people to demand for the properties.

4.8 Short-run Relationship Estimation

The result of short-run relationship between Malaysian house price and its determinants is presented in Table 4.7. The table presents that the coefficient of ECT is statistically significant at five percent level of significant. The negative sign of the coefficient indicates that short-run of Malaysian house price is converging to its fundamental value in long-run over the 34 years from 1985 to 2018 averagely. On average, the coefficient indicates that the speed of adjustment towards long run equilibrium in a year is extremely slow. In short, the speed of adjustment of Malaysian house price in short-run is 19.786 percent converging to its fundamental value within a year averagely.

According to Zainuddin (2010), the AFC during 1997 caused a divergence of house price from its long-run equilibrium as shown in the analysis of Switching and Non-switching model. It was diagnosed to have a housing bubble during the end of 1990s. Then, the house price converge to its fundamental value with an extremely slow speed of adjustment. Furthermore in late 2000s, Yip *et al.* (2016) reported that even though Malaysian house price remains high, the market is yet to reach another housing bubble.

Based on Table 4.7, the result shows that only coefficient s of *HPI* (-1) and *INT* (-1), and *HSG* (-1) are statistically significant at five percent level of significant. Therefore, as for the concern of this research, the *HPI* is affected by lag one year of *HPI,* and *INT*.

Table 4.7
Short-run Relationship

Error Correction	**Coefficient**	**Std. Error**	***t*-statistic**	**Prob.**
ECT (-1)	-19.786	22.972	-2.576	0.013*
HPI (-1)	0.589	0.066	2.744	0.021*
HPI (-2)	0.693	0.341	0.953	0.351
INT (-1)	-2.588	0.399	-2.450	0.018*
INT (-2)	2.066	2.586	0.184	0.846
DEX (-1)	0.382	1.828	1.047	0.311
DEX (-2)	-0.274	0.365	-0.847	0.410
HSG (-1)	2.542	1.393	2.325	0.047*
HSG (-2)	0.666	1.114	0.597	0.557
POP (-1)	0.027	0.026	1.014	0.326
POP (-2)	0.014	0.030	0.448	0.661
GDP (-1)	0.008	0.004	0.178	0.861
GDP (-2)	0.002	0.004	0.530	0.604
C	0.367	0.223	1.646	0.119

Note: * significant at 5 percent level

The coefficient of *HPI* (-1) is statistically significant at five percent level of significant since the probability value is less than 0.05. Thus, *HPI* (-1) significantly affects the house price. *HPI* (-1) has a positive relationship with Malaysian house price, which is indicated by the positive coefficient value. On average, when *HPI* (-1) increases by one percent, Malaysian house price increases by 0.589 percent and vice versa. From the finding, it can be explained that the short-run house price is affected by its previous information. According to Malpezzi and Wachter (2005), previous information can affect current price level. The level and trend of house price in previous period might have high probability to determine the level of house price in the future. Also, based on the study in Zainuddin (2010), previous house price can often be the reference for the people to construct an expectation of future house price. In other words,

when previous house price is high, the market will often expect house price in the future remains high as well.

Meanwhile, the coefficient of *INT* (-1) is statistically significant at five percent level of significant since the probability value is less than 0.05. Thus, lag one year of *INT* is significantly affecting house price. *INT* (-1) has a negative relationship with Malaysian house price in short-run, which is indicated by the negative coefficient value. On average, when *INT* (-1) increases by one percent, Malaysian house price decreases 2.588 percent in the short-run. This is explained by the cost of borrowing where the interest rate can affect the investment and buying condition in housing market significantly. Kagen (2018) mentioned that interest rate influences the profit gained from the investment portfolio since the interest rate is the cost that investors and homebuyers have to pay back. In short run, the result shows that the interest rate affects the house price with similar result as the previous study. As mentioned by Thomsett and Kahr (2007), in the short run, low interest rate reduces mortgage payment, therefore the demand for houses would increase and drive the price up.

4.9 Diagnostic Checking for House Price Model

The diagnostic checking process includes normality test and autocorrelation test. The normality test identifies whether the residual is normally distributed. The result of normality test presented in Figure 4.1 shows that the probability of Jaeque-Bera is 0.747, which is larger than 0.05. This indicates that the test is statistically insignificant at five percent level of significant. Thus, H_0 is not rejected, which means that the residual is normally distributed.

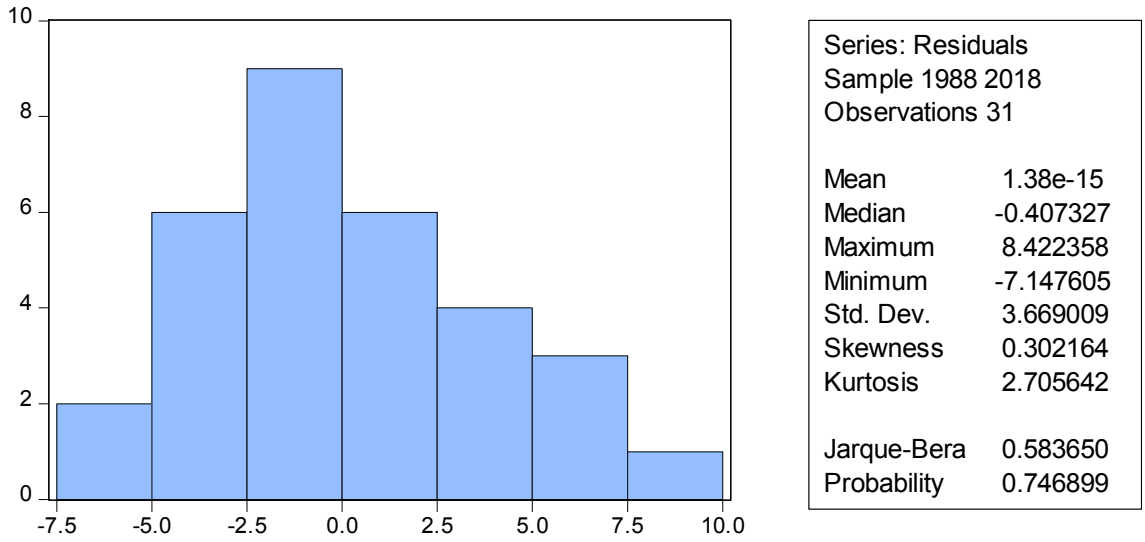

Figure 4.1
Jarque-Bera Normality Test for House Price Model

Table 4.8 shows the result of Breusch-Godfrey for autocorrelation test. The result of autocorrelation test shows that the probability chi-square is 0.817, which is larger than 0.05. This indicates that the test is statistically insignificant at five percent level of significant. Thus, H_0 is not rejected, which means that there is no autocorrelation in the residual.

Table 4.8
Breusch-Godfrey Serial Correlation LM Test for House Price Model

F-statistic	0.093	Prob. F	0.912
Obs*R^2	0.405	Prob. Chi-Square	0.817

4.10 Identification of Housing Bubble in Malaysia

The result of PSM is presented in Table 4.9. The result shows that the coefficient of Δp_{t-1} is not statistically significant since the probability value is more than 0.05. Thus, Δp_{t-1} is not significantly affecting Δp_t. The Δp_{t-1} has a positive relationship with Δp_t, which is indicated by the positive coefficient value. On average, when Δp_{t-1} increases

by one percent, Δp_t increases by 0.253 percent and vice versa. This explains that previous information has impact on current house price, but it is not significant.

Meanwhile, the result shows that the coefficient of $p_{t-1}^* - p_{t-1}$ is statistically significant at five percent level of significant since the probability value is less than 0.05. Thus, $p_{t-1}^* - p_{t-1}$ is significantly affecting Δp_t. The $p_{t-1}^* - p_{t-1}$ has a negative relationship with Δp_t, which is indicated by the negative coefficient value. On average, when $p_{t-1}^* - p_{t-1}$ increases by one percent, Δp_t decreases by 0.802 percent and vice versa. The result of the sign of the coefficient shows that the actual value (p_{t-1}) is higher than fitted value (p_{t-1}^*). This result explains that the actual house price exceeds the fundamental value to justify that there could be a possibility that the housing market experienced bubble (Yip *et al.*, 2016). Therefore, based on the coefficient of $p_{t-1}^* - p_{t-1}$ shown by PSM, Malaysian housing market did experience housing bubble in the past 34 years.

Lastly, the coefficient of Δp_t^* is not statistically significant since the probability value is more than 0.05. Thus, Δp_t^* is not significantly affecting Δp_t. The Δp_t^* has a negative relationship with Δp_t, which is indicated by the negative coefficient value. On average, when Δp_t^* increases by one percent, Δp_t decreases by 0.242 percent and vice versa.

Table 4.9
Price Stability Model

Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
Δp_{t-1}	0.253	0.186	1.363	0.184
$p_{t-1}^* - p_{t-1}$	-0.802	0.331	-2.427	0.022*
Δp_t^*	-0.242	0.278	-0.870	0.392
R-squared	0.538			
Adjusted R-squared	0.502			

Note: * significants at 5 percent level

The result of PSM proves the real situation of housing market in Malaysia. This bubble phenomenon was realized in the beginning of 1990s where there was a strong growth of economy and AFC in Malaysia (Hwa & Keng, 2004). The implementation of expansion monetary policy over the period of 1990s encouraged an increasing penetration of bank credits and real estate debt in the market (Renaud *et al*., 1998). This had increased the demand for real estate market that resulted a boost of 26 percent in Malaysian house price in 1995 (Global Property Guide, 2007). With the high demand for properties for multiple purposes, Malaysian housing market experienced a volatile environment especially due to short-selling of properties for capital gain purposes in 1990s (Hwa & Keng, 2004). Afterwards, the recovering of housing market towards its equilibrium can be explained by the efforts of Malaysian government which developed the infrastructure and transportation as well as providing housing schemes to stimulate housing demand for assisting Malaysian to own houses.

Hence, PSM has successfully shown that Malaysian housing market endured volatility of house price that exceeds the fundamental value. This evidence shows that there was a bubble occurs in Malaysian housing market over the past 34 years.

4.11 Diagnostic Checking for Price Stability Model

The diagnostic checking process includes normality test and autocorrelation test. The normality test identifies whether the residual is normally distributed. The result of normality test presented in Figure 4.2 shows that the probability of Jaeque-Bera is 0.831, which is larger than 0.05. This indicates that the test is statistically insignificant at five percent level of significant. Thus, H_0 is not rejected, which means that the residual is normally distributed.

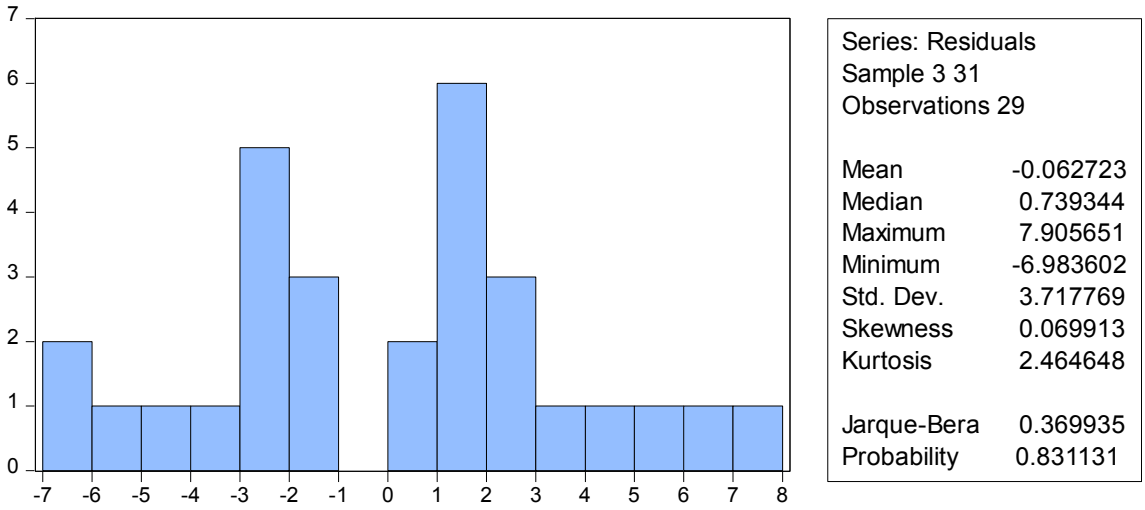

Figure 4.2
Jarque-Bera Normality Test for Price Stability Model

Table 4.10 shows the result of Breusch-Godfrey for autocorrelation test. The result of autocorrelation test shows that the probability chi-square is 0.660, which is larger than 0.05. This indicates that the test is statistically insignificant at five percent level of significant. Thus, H_0 is not rejected, which means that there is no autocorrelation in the residual.

Table 4.10
Breusch-Godfrey Serial Correlation LM Test for Price Stability Model

F-statistic	0.354	Prob. F	0.706
Obs*R^2	0.830	Prob. Chi-Square	0.660

4.12 Conclusion

This study discovers that interest rate, government development expenditure, and government housing scheme affect Malaysian house price in long-run relationship. However, only *DEX* can successfully explain the relationship with expected result. The result of VECM shows that Malaysian house price is converging to its fundamental value in long-run from 1985 to 2018. This result explains that even though Malaysian

house price is higher than its fundamental value and indicates that there was a housing bubble occurs in the market, the situation is still improving as shown by the result of VECM that house price is converging to its long-run trending. It further presents a dynamic of house price to recover to its equilibrium after experienced a shock in the market. The finding of PSM shows that Malaysian housing market did experience housing bubble in the past 34 years.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Chapter Five summarizes the findings of this study. This chapter is divided into several parts which include summary of findings, policy implications and recommendation, limitation of the study, suggestion for future studies, and conclusion.

5.2 Summary of Findings

The finding shows that interest rate has a significant positive relationship with Malaysian house price. According to Sutton *et al.* (2017), the interest rate alone is not always significantly reducing the housing demand. Similar to the explanation of Larock (2017), it was healthy and growing economic condition that bring more impacts to the house price rather than interest rate. Such condition is accompany by higher income, higher employment rate, and higher consumer confidence over the housing market. These are all external factors that cause much more significant impact towards the housing market rather than just the government policies. On the other hand, the development expenditure meets the positive relationship with house price. This was explained by Bryant (2014) that development expenditure drives house price up due to the development in infrastructure and public transportation such as railway, bus, parking facilities, and so on that can increase the property value to the region. Meanwhile, the short run relationship was presented. Finding shows that Malaysian house price converges to its long-run values. This indicates that the market was getting recovered after experienced housing bubble. The finding of price stability model shows that Malaysian housing market had experienced housing bubble. Therefore, given the house

price remains high and converges to its fundamental value over the 34 years, housing bubble did occur in Malaysian housing market.

5.3 Policy Implications and Recommendation

In monitoring the long-run house price, BNM plays an important role in establishing suitable asset-liability management and liquidity management in housing market. This precaution management helps in managing issues such as transaction costs, time delaying, and varying availability of buyers in Malaysian housing market. This can prevent imperfect information to cause over-excessing demand or supply in housing market. Besides asset-liability management and liquidity management, risk management technique through mortgage financing is also important to manage house price bubble by banking and insurance sectors. For instance, insurance scheme in housing sector has to be established in order to protect homebuyers from facing difficulties to repay their housing loans that caused by adverse economic conditions like economic downturn. The monitoring process of those decisions and schemes is important as those are the factors that influence house price in long-run.

In short-run wise, the recommendation for monitoring housing market is by adopting suitable measurement in credit screening process. Credit screening process is very crucial for banks and financial institutions to determine homebuyer's credit scores. Even when there is low interest rate provided to stimulate housing market, credit scores of homebuyers are still important to prevent default cases. The credit scores represent as an indicator for lenders to determine their risk of lending out housing loan to homebuyers. It is an important reference for banks and financial institutions to reflect a mortgage application. A credit score consists three-digit number that derived from credit agency that rates a borrower's credit quality by screening outstanding debts such as credit card debt, personal loan debt, car loan debt, mortgage loan debt, and student loan

debt as well as legal cases against the borrower's name, payment pattern and other financial information. By screening credit score, an appropriate lending decision can be made by imposing suitable size of the loan and down payment. Therefore, main credit agencies in Malaysia, namely Central Credit Reference Information System (CCRIS), Credit Tip-Off Service (CTOS), RAM Credit Information Sdn Bhd (RAMCI), and the Credit Bureau Malaysia play crucial role to provide valid information of each homebuyers in order to design suitable loan size in purchasing houses so that the issue of subprime mortgage will never happen in Malaysia.

Lastly, to overcome housing bubble, it is important for reducing existing policies or schemes that encourage expansionary monetary policies. Policy makers need to revise loans and housing schemes provided such as subprime loans, zero down payment for buying houses, regulation of holding and selling properties as well as construction of new houses. Authorities such as commercial banks have to gradually reduce the approval of housing loan applications so that the default of home buyers and investors does not shut down the financial system and cause economic crisis.

5.4 Limitation of the Study

In this section, limitation of the study is discussed in order to provide understanding to difficulties and disadvantages of processing this research. The main limitation or obstacle that occurs in this study is the tool of identifying housing bubble. This point always represents as the main concern of many scholars and researchers to identify housing bubble in a region. Since the tools of identifying housing bubble are way too broad and extensive, this study could not promise to provide an analysis that can explain the identification of housing bubble comprehensively.

Additionally, time constrain is another limitation that could not make this research a perfect one. It causes insufficient information in terms of fetching some

important and deeper messages such as the policy implications in Malaysian housing market like stamp duty and real property gain tax (RPGT). The information of these factors can explain house price more detail and specific especially in terms of analysis of states and regions. Other than that, this research unable to cover the supply side of housing market because of the inelastic in short run.

Lastly, this study does not investigate different property types and their relationship with housing bubble. The separation of houses into different property types also being important in analysing house price behaviour and housing bubble. It can explain different type of properties' contribution to the bubble. The result is believed to assist authorities in finding out the most significant property type that being easily affected by bubble.

5.5 Suggestion for Future Studies

This study is limited to quantitative analysis, which restricts the consideration of behavior and psychological influences that build up another type of house price model with regards to future price expectation. Future studies should consider this as an important suggestion as the combination of qualitative and quantitative data could construct a better house price model in terms of determining price expectation that affects house price to cause bubble. This might become a direct analysis towards the analysis of housing bubble in a region.

Next, despite this study uses time series analysis, the information contained in the outcome is still insufficient due to the analysis being too aggregate. It is believed that cross-sectional analysis can also play a significant role in housing market. The comparison between regions such as cities and countries could further explore the behavior and trending of house price and housing bubble based on different characteristic with a specific environment. For example, the different pricing of houses

between rural and urban areas, developed and developing countries, as well as different types of properties in housing market in order to create a comprehensive picture that influences house price based on different angles.

In short, housing bubble can affect the economy in a wide range. It is therefore important for future study to explore the behavior and estimation of housing bubble in order to make prevention from destructing any economy component. The future studies can also provide important information such as appropriate approaches and government plans to control the activities in housing market.

5.6 Conclusion

Housing market always reflects as a big concern for many parties, which include policy maker, developers, banking sectors, and residence. It can influence an economy as well as the affability of residence to own a house. Overall, the result of this study is satisfying as it can present the situation of Malaysian housing market based on the policies implemented by Malaysian government. The main features of this study is the examination of Malaysian house price with the chosen fundamental variables in long-run and short-run. Results shows that house price in Malaysia tends to converge to its fundamental value. Also, price stability model proves that it is out of the stable price range and considered there had been a bubble phenomenon. However, it should be reminded that housing bubble is not easy to confirm even with conventional bubble theories (Koh *et al*., 2006). Hence, there is still a lot of room for future improvement and investigation. Last but not least, this study aims to build up knowledge and understanding of the concept of government policies and housing bubble in Malaysia. The information provided in this study is to hope for a stronger motivation for readers to stay aware of the situation of Malaysian housing market and how the government policies affect the house price.

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APPENDIX

A. Derivation of Malaysian House Price Index

The Malaysian HPI is generated by using Lapspeyres weighted formula (NAPIC, 2017). The data chosen is developed from 86 separate price models that represent 86 house category-index areas. It is derived from 46 models for terraced houses, 11 models for high-rise units, 13 models for detached houses, and 16 models for semi-detached houses. These indices are fixed-weight Laspeyres indices that used to estimate average house price of current period. The value of current house price will be used to compare to actual house price of base year (2000). NAPIC works out on those values and make revaluation each period so that the index presents pure price changes on a basis where the variations in housing characteristics are kept constant. Therefore, Laspyeres index is generated in the Equation [A.1].

$$Lt = \frac{\exp(\sum Bj(t)Qj(2000)}{exp^{i=1}(\sum B_j(2000)Q_j(2000)} \times 100 \qquad [A.1]$$

where exp = exponent

Lt = Laspyeres index

$Bj(t)$ = the hedonic model regression coefficient of current period

$B_j(2000)$ = the hedonic model regression coefficient of the base year 2000

$Q_j(2000)$ = the characteristic averages for houses sold in 2000

In Equation [A.1], the denominator refers to actual house price in 2000 while the numerator is the current period. Therefore, for each Laspyeres index in a given time period that NAPIC obtains from Equation [A.1], a linear regression estimation of the natural logarithm is generated to form adjusted current house price base on base year (2000). To be specific, the linear regression is presented in Equation [A.2].

$$lnP_{it} = \beta_0(t) + \beta_1(t)X_{1it} + \beta_2(t)X_{2it} + \cdots + \beta_m(t)X_{mit} + \varepsilon_{it} \quad [A.2]$$

where lnP_{it} = natural logarithm of house price at time t

$\beta_0(t)$ = constant term

$\beta_m(t)$ = coefficient for the numerical and quality variable m for period t

X_{mit} = the observed value of the quantitative values for house i in period t

ε = error term

Each annual house price index is calculated by the regression coefficients. Its computation sets the price indices 2000 equals to 100.00 as base year. According to NAPIC (2017), the index is a weighted average that derived from 14 state-All Houses indices in Malaysia. The annual house price index being important in terms of summing up the state-terraced, state-high-rise, state-detached, and state-semi-detached indices.

B. Affordability Index

The affordability index describe the power of homebuyer to own a house. Theoretically, higher affordability index presents higher purchasing power on houses. In equations below, there are several key factors used to construct affordability index (Hashim, 2010). This index was developed by the National Association of Realtors (NAR) in order to measure the purchasing power of median income group to purchase median priced properties. The calculation of affordability index takes several factors into account, which include mortgage interest rate, down payment, and household income. In short, government policies that affect any of these factors will eventually influence the affordability index of the whole model. In

this case, higher affordability index reflects easier for homebuyer to purchase houses and vice versa.

Monthly Payment = Median House Price × 0.8 × $(\frac{R}{12}) \div (1-(1 \div (1+\frac{R}{12})^{360}))$ [B.1]

Necessary Monthly Income = ((Monthly Payment ×12) ÷ Median Family Income) ×100 [B.2]

Qualifying Income = Income Necessary to Qualify for a Loan for Median House Price [B.3]

= Monthly Payment × 4 × 12

Housing Affordability Index = (Median Family Income ÷ Qualifying Income) × 100 [B.4]